THE ARCHITECTURAL FORUM

IN TWO PARTS

PART ONE

ARCHITECTURAL DESIGN

AUGUST

1928

CONTENTS FOR AUGUST 1928

PART ONE—ARCHITECTURAL DESIGN

PART TWO—ARCHITECTURAL ENGINEERING & BUSINESS

PARKER MORSE HOOPER, A.I.A., Editor
KENNETH K. STOWELL, A.I.A., Associate Editor
Contributing Editors:
Harvey Wiley Corbett; Aymar Embury II; Charles G. Loring; Rexford Newcomb; C. Stanley Taylor; Alexander B. Trowbridge
Published Monthly by

ROGERS & MANSON COMPANY
383 Madison Avenue, New York

Howard Myers, Pres.; James A. Rice, Vice-Pres.; Paul W. Hayes, Vice-Pres.; Robert Sweet, Sec. and Treas.
Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00
Single Copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. All Copies Mailed Flat
Trade Supplied by American News Company and its Branches. Entered as Second Class Matter at the Post Office at New York, N. Y.

State Bank Building, Chicago, Graham, Anderson, Probst & White, Architects
Equipped throughout with Bakelite Molded Switch Plates

8486 Bakelite Molded Switch Plates in State Bank Building, Chicago

THE greater safety and the superior appearance of Bakelite Molded switch and outlet plates, is bringing about their adoption for fine buildings of every type. One of the latest of these is the new State Bank Building, Chicago, which also houses the Chicago Stock Exchange.

Electrical switches and outlets should always be completely insulated. Any possibility of suffering an electrical shock of any sort should be effectively guarded against. As Bakelite Molded is an insulation material, cover plates made of it provide this complete protection.

Another advantage of Bakelite Molded plates is their permanent beauty of color and finish. They never require polishing, and do not corrode or stain. All of the leading wiring device manufacturers can furnish Bakelite Molded plates, and as a precaution against imitations, are marking each one with the trade-mark **BAKELITE.**

BAKELITE CORPORATION

247 Park Avenue, New York, N. Y. Chicago Office, 635 West 22nd Street
BAKELITE CORPORATION OF CANADA, LTD., 163 Dufferin Street, Toronto, Ont.

BAKELITE

REGISTERED U. S. PAT. OFF.

THE MATERIAL OF A THOUSAND USES

"The registered Trade Mark and Symbol shown above may be used only on products made from materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products."

THE EDITOR'S FORUM

THE SULLIVAN MEMORIAL

LOUIS H. SULLIVAN lies in Graceland Cemetery without tombstone or marker of any kind. It has been proposed that the architects of Chicago erect a monument that will suitably mark his grave and be a memorial to his genius. For this purpose a joint committee has been appointed from the North Shore Architects' Association (from which the suggestion came initially), from the Chicago Chapter of the Institute, from the Illinois Society of Architects, from the landscape architects, from the building industry and from the laity. This committee, not knowing the amount available, has made no definite design for the memorial except to determine that it shall be of granite and in the decorative style so expressive of his philosophy and associated with his memory. It will also be carved with some account of Sullivan's life, some brief record of his achievements, and some suggestion of his influence.

In the three years that have passed since Sullivan's death, his fame has constantly grown. Architecture since the World War has entered upon a new era, and has begun to express itself in forms and speak with a language moulded more nearly to the heart of America. To this new destiny Sullivan, with the zeal of the prophet and the courage of the adventurer, pointed the way. By his architectural works, great in scope and power; by his drawings, unsurpassed in beauty and originality; by his writings, rich in poetry and truth; by his teaching, persuasive and eloquent; and by his philosophy, where in three words, "Form follows Function," he summed up all truth in art, Sullivan earned his place as one of the greatest architectural forces in America. Thomas E. Tallmadge, 160 North LaSalle Street, Chicago, is the chairman of the committee.

GOVERNMENT BUILDING IN PARIS

A BUILDING to house the offices of the American government in Paris is to be erected on the site of the premises occupied by the "Union Artistique" Club, on the Place de la Concorde, the purchase of which is announced in dispatches from the French capital. The new building will house the offices of the 15 American government agencies in Paris, including the embassy and the consular services. The structure is to harmonize architecturally with its surroundings and will be built of French limestone.

The government expects to carry out the original plan for a building on this site prepared by the great French architect, Ange-Jacques Gabriel, who, in the reign of Louis XV was responsible for the monumental symmetry of the construction of the Place de la Concorde as we see it today. Such a building as the government now has in mind would correspond with the architecture of the Hotel Florentine, the present residence of Edward Rothschild, located at the corner of the Rue de Rivoli and the Rue Florentine, and would balance the two larger structures of the Ministry of Marine and the Hotel Crillon, in accordance with the original Gabriel design and plan.

TOWN PLANNING IN CANADA

WITHIN the last few weeks two Canadian cities, Quebec and Ottawa, have enacted statutes governing town planning. The Quebec commission is "given full power to replan those parts of the city that have suffered from haphazard development, or from what the *Journal of the Town Planning Institute of Canada* characterizes as 'building anarchy'; and to create a comprehensive plan for future development with the exercise of necessary zoning powers." Editorializing, the *Journal* says that the trend of thinking in a city rich in historical tradition, as Quebec is, might naturally be toward extreme conservatism. The development and passage of so progressive a law are attributed to a definite reaction against bad manners in building which have become established practice during the past few years: "It has come to pass because the more public spirited citizens of Quebec have become disgusted with the building anarchy which, on the plea that business is business, denied the right to existence of historic places in their natural setting, and disfigured the whole city with new structures flung up anywhere and everywhere in barbarous disregard of architectural amenity and the rights of the community."

Within two weeks after the passing of the Quebec act, the city of Ottawa, it is reported, applied for and received the right to exercise architectural control over certain proposed new developments. The new Alberta town planning act has clauses authorizing a permanent provincial town planning board, one duty of which shall be to "assist and advise any rural authority in devising ways and means of preserving the natural beauty of the locality and ensuring that new buildings and erections therein shall be so designed and located as not to mar the amenities of the locality." It takes definite cognizance of buildings located on any highway to which the act applies, making regulations as to their design, regulation, and construction. In Great Britain, several cities, notably Edinburgh and Bath, interpreted the clause in the Town Planning Act which gives power to a local authority to prescribe the "character" of buildings, to mean community control over the design of buildings as well as their suitability to their locations.

THE STORK FOUNTAIN AND PARLIAMENT BUILDING, COPENHAGEN

FROM A PHOTOGRAPH BY SIGURD FISCHER

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER TWO

AUGUST 1928

THE ARCHITECTURE OF DENMARK: PART I

BY
DR. TYGE HVASS

TO properly understand and judge modern Danish architecture, it is necessary to know something of the country's historical background and something of the character of the country. Denmark is a land surrounded by water and made up of rolling hills, which never attain a height of more than 500 feet. The coast line is irregular, cut by deep bays and fjords. It is a land of farms, and its smiling fields are wreathed by woods, which form a living frame for golden corn fields. As early as the year 1000 the country was densely populated, and of some 1600 country churches now existing, no fewer than 1100 are of mediæval origin and bear the impress of Romanesque architecture.

Scattered about the country the great landed proprietors,—the later nobility,—built their manor houses and castles. Altogether, about 1000 of these manor houses are to be found today. They are located in the most beautiful scenic spots, surrounded by moats, and set in splendid parks framed by wreaths of lake and woods. In the decades from 1550 to 1600, the period of the great baronial lords, most of these manors underwent renovation and modernization in accordance with the tastes and requirements of that age. The nobility imported a number of Dutch architects to supervise their building, and manor after manor was made over in the so-called Dutch Renaissance style, with heavy, massive brick walls, and copper-covered roofs. But even though the buildings were constructed under the supervision of Dutch architects, their character is unmistakably Danish. The materials and the craftsmanship were Danish, and the arrangement of the buildings determined by considerations of place and of the needs of the people. This remarkable period of building, which, so to say, transformed the aspect of the whole countryside in the course of a generation, culminated in one of the most beautiful Renaissance buildings in Europe,—Kronborg, Hamlet's castle, which mirrors itself in the waters of Oresund, at Copenhagen's entrance.

When the Danish peasants secured their freedom

Photo. Courtesy American Scandinavian Foundation

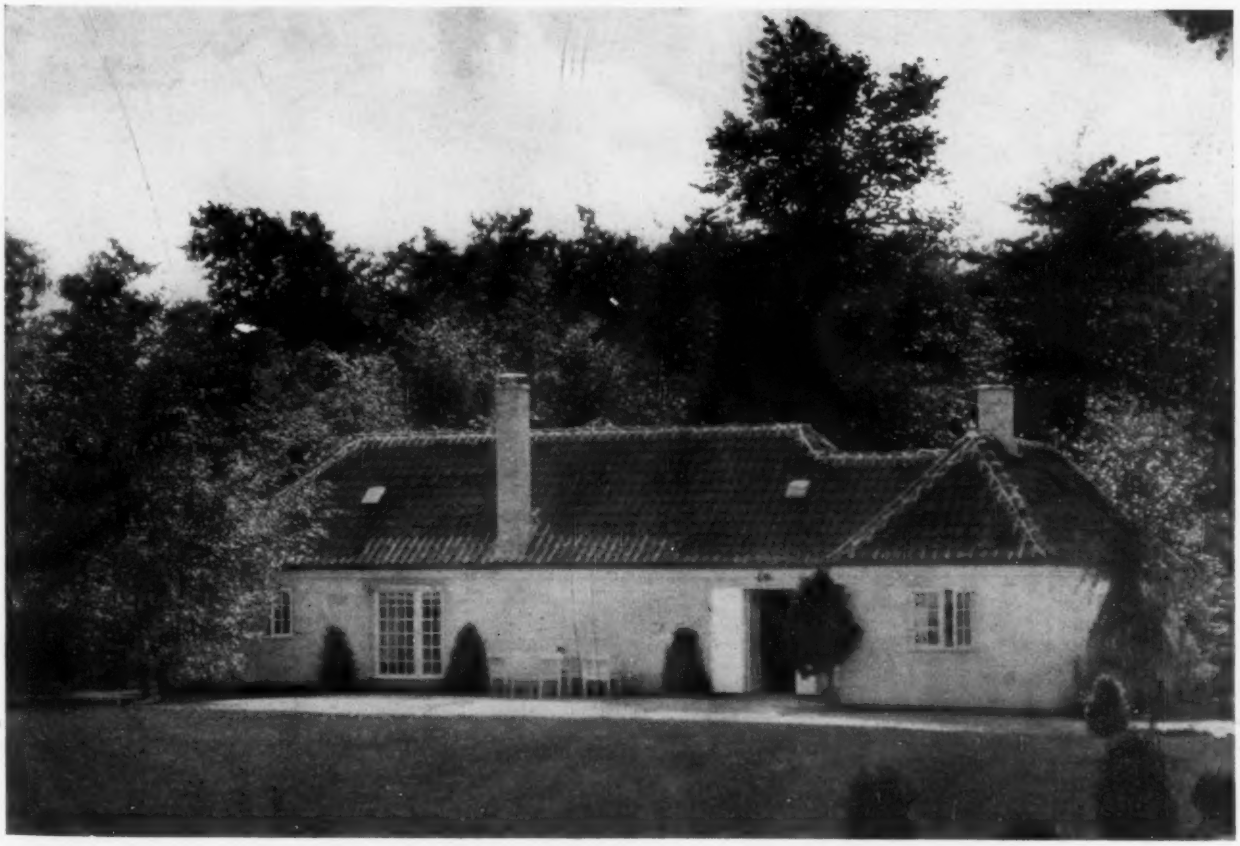
Town Hall Square, Copenhagen

COPENHAGEN

Photos. Sigurd Fischer

OLD ROOFS, COPENHAGEN

RURAL DENMARK

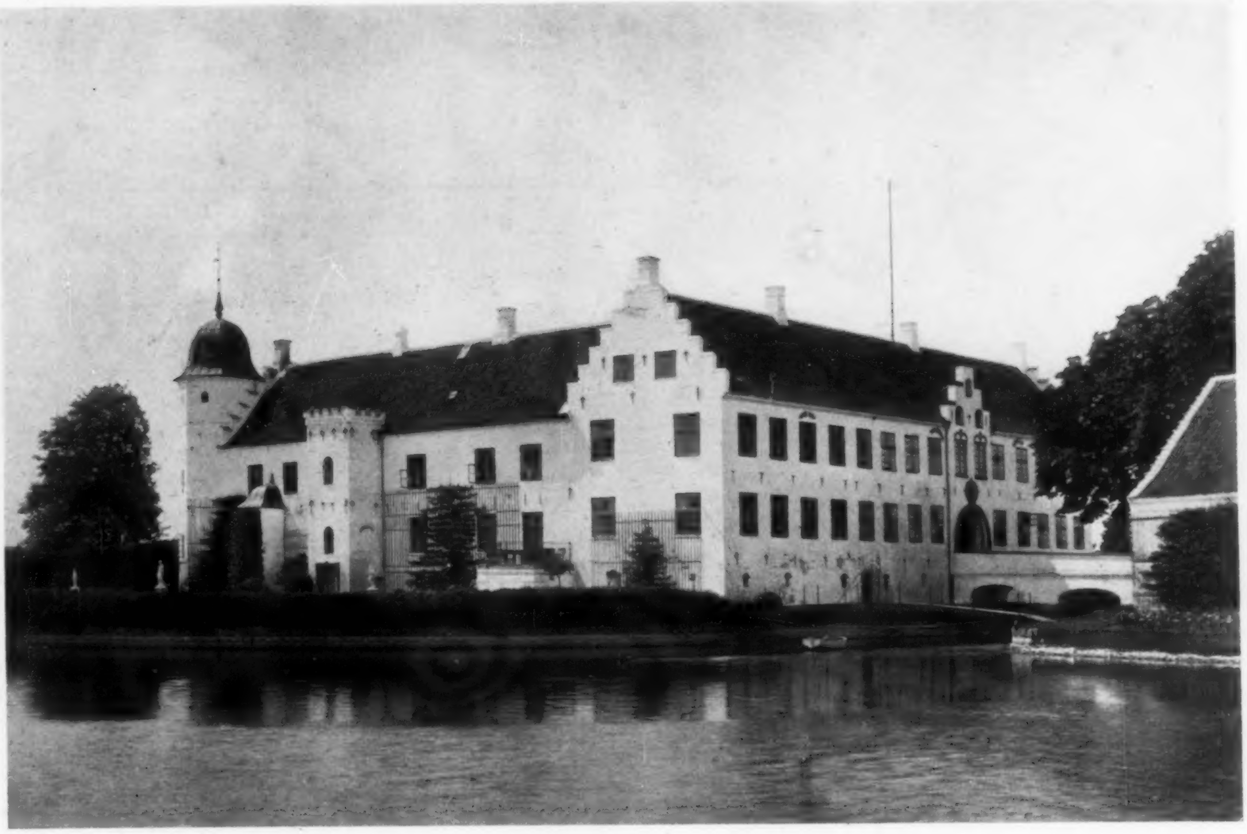


COUNTRY HOUSE, COPENHAGEN
TH. HJEJLE & N. ROSENKJAER, ARCHITECTS

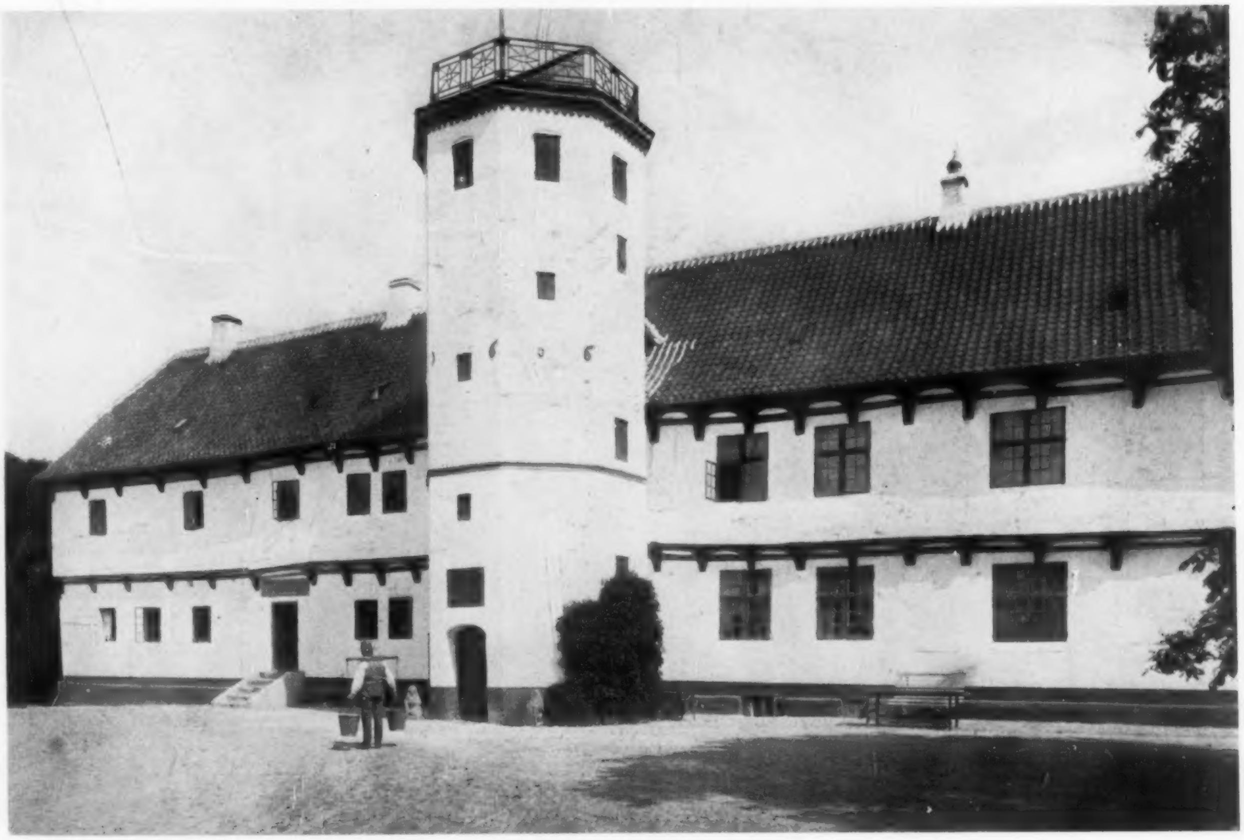
LOVENHOLM MANSION, DENMARK

Photos. Courtesy American Scandinavian Foundation

VILLESTRUP MANSION, DENMARK



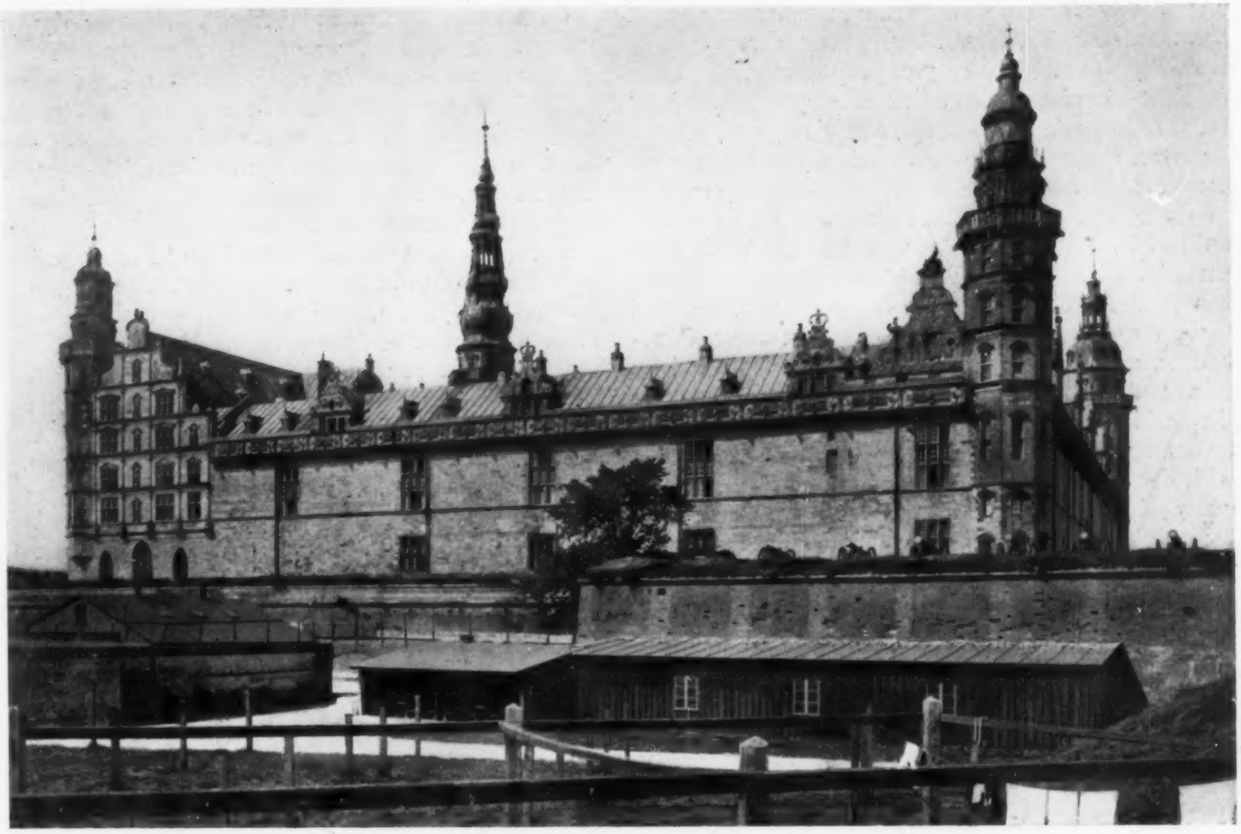
FRYDENDAL MANSION, DENMARK



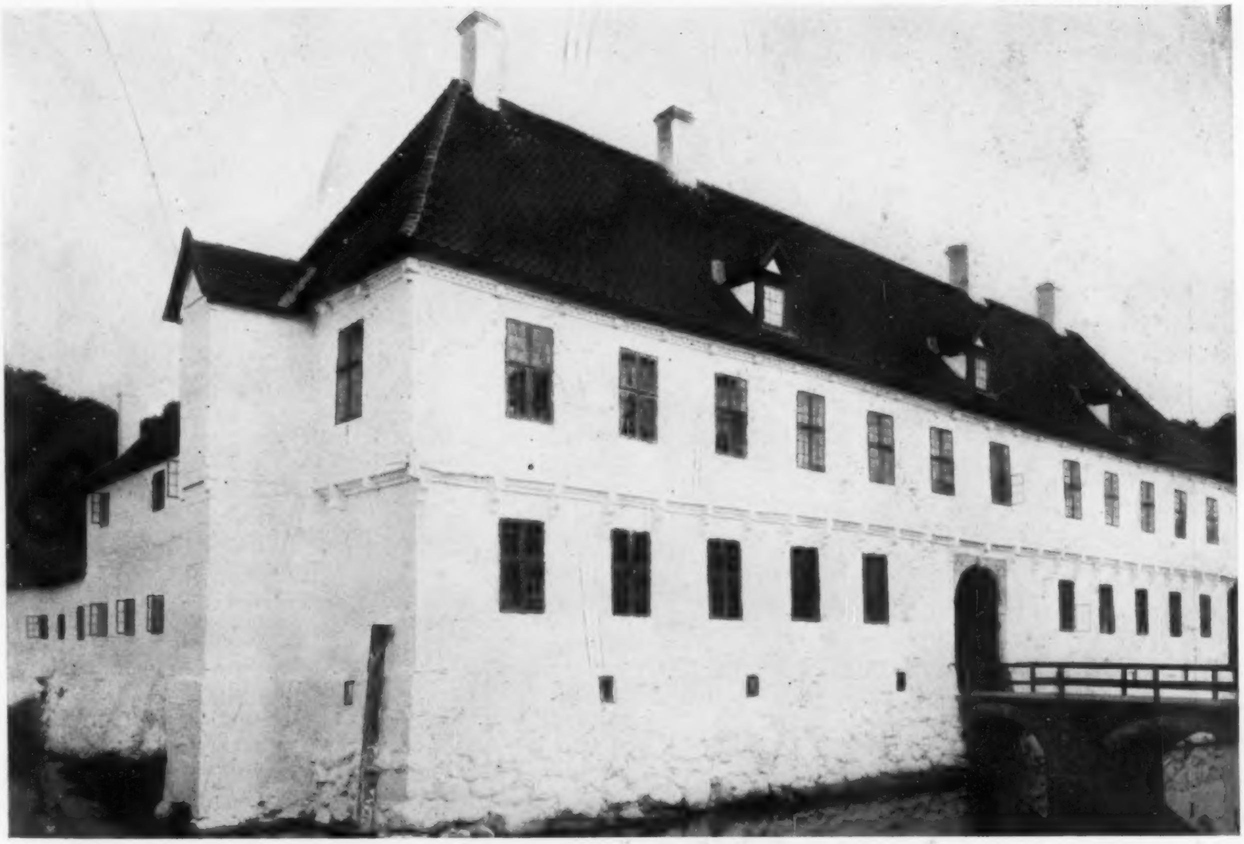
RUDBJERGGAARD MANSION, LOLLAND, DENMARK

BRAHETROLLEBORG MANSION, DENMARK

GYLDENSTEN MANSION, DENMARK



KRONBORG CASTLE, ELSINORE



HOLMSGAARD MANSION, DENMARK

they moved their homes out from the villages and built them on their own farms. These houses were usually erected in quadrangular groups; opposite the main building stood the barn, and at the center, across from the entrance to the main building, was a large gateway. The main buildings and the barns were connected at both ends by stables, facing the outside of the square yards. These houses were, as a rule, built of half-timber construction, and the roofs were thatched with straw. This attractive building plan has held its own down to the present time, and though the peasants have modernized their farmhouses, and the half-timber has been supplanted by brick and the thatch roofs by tile, they have retained the main features of the original buildings. In the towns the rising middle classes built their homes with the same materials of half-timber and tile, and many of the houses bear traces of motifs borrowed from the castles of the great nobility. Many of these patrician houses are still to be found here and there.

Of all the Danish monarchs, Christian IV was the greatest builder, and to his love for splendid structures we owe an impressive series of castles and public buildings which must be numbered among the finest architectural monuments of their age. We mention here merely the famous Round Tower of Copenhagen, the Copenhagen Exchange, and Rosenborg and Frederiksborg Castles. In 1730 the Royal Academy of Arts was established, and French artists were imported to be its first directors. Among these, the architect Jardin, who came to Denmark directly from Italy, must be accounted the most notable. He supervised the construction of a number of public buildings which compare favorably with the finest examples of architecture elsewhere in Europe. His buildings exemplify the best of eighteenth century French architecture, tempered by Nordic moderation, and without the French Baroque extravagance. they possess a simplicity of line and a quiet strength which mark them as characteristically Scandinavian.

Hesselagergard Mansion, Denmark

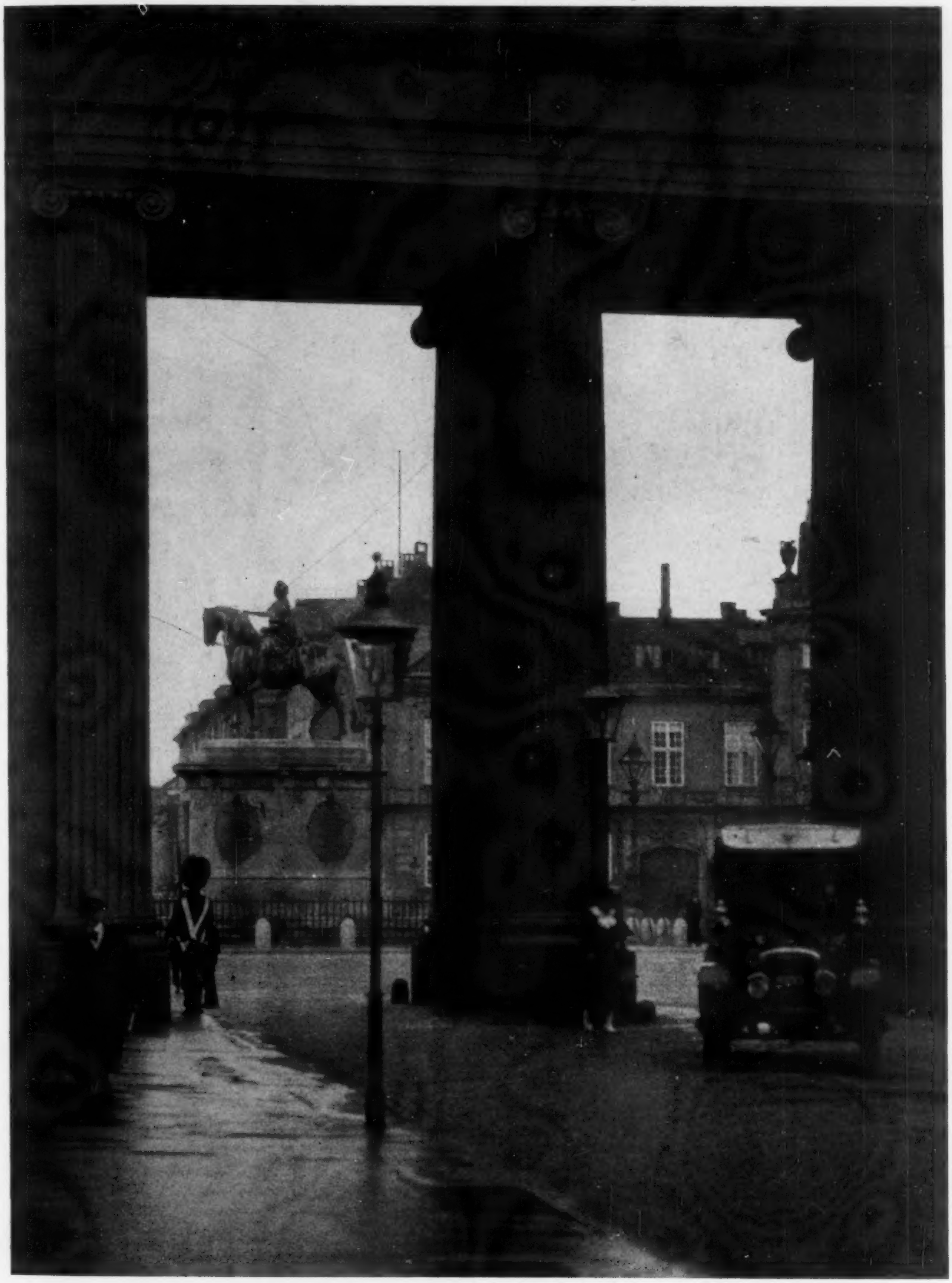
Photos, Sigurd Fischer

THE MARBLE BRIDGE, COPENHAGEN

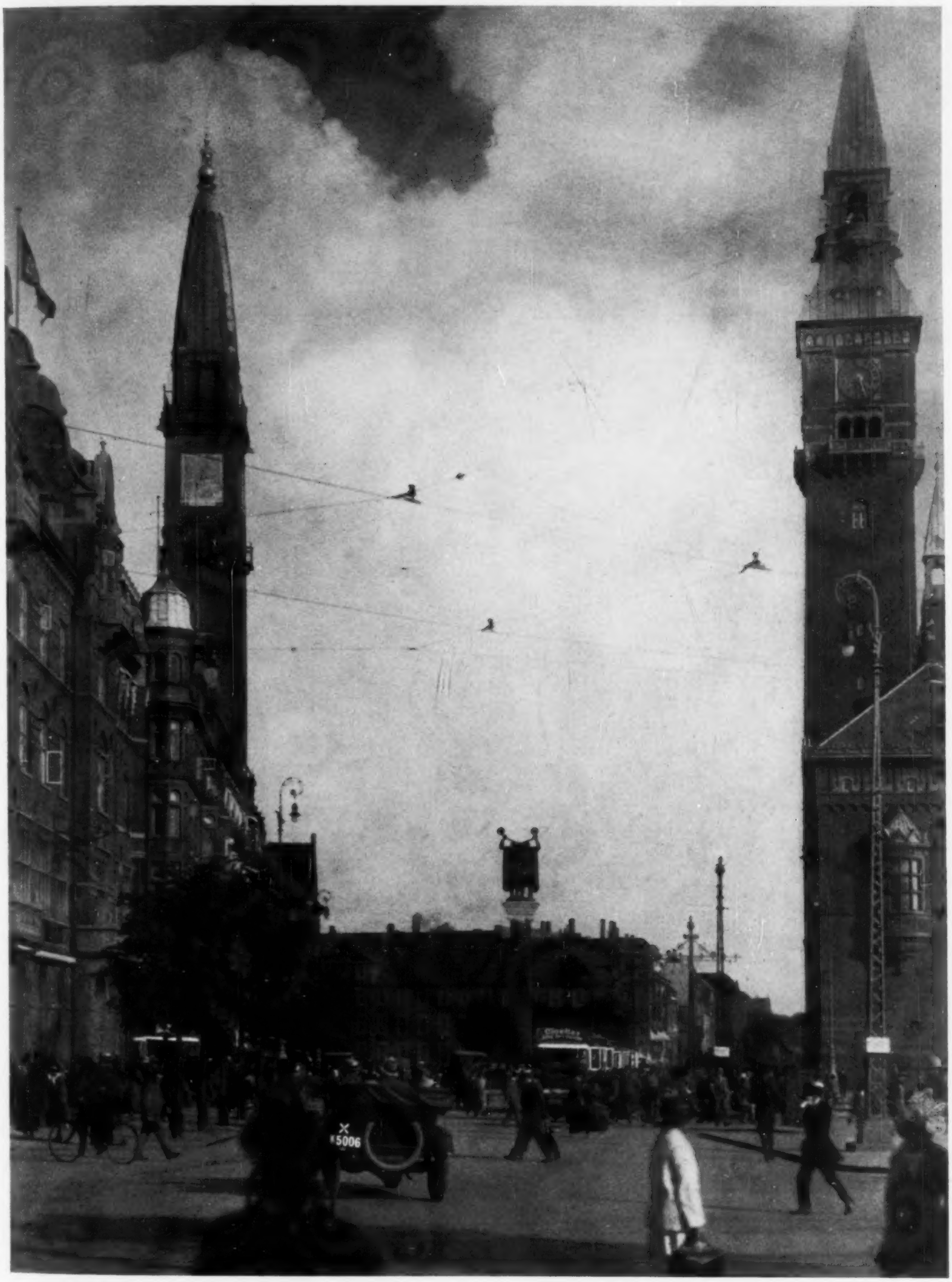
ONE OF THE TWO PAVILIONS THAT FORM THE ENTRANCE TO THE ROYAL LIBRARY, COPENHAGEN

BOURSE AND STOCK EXCHANGE, COPENHAGEN

FISH MARKET, THE RECONSTRUCTED NIKOLAJ TOWER AND THE EQUESTRIAN STATUE OF BISHOP ABSALON, FOUNDER OF COPENHAGEN



COLONNADE AT AMALIENBORG CASTLE, COPENHAGEN
DESIGNED BY HARSDORFF



TOWN HALL SQUARE, COPENHAGEN

ENTRANCE GATE, KONGENS HAVE, COPENHAGEN

PETER LIP'S HOUSE IN DYRCHAVEN, COPENHAGEN

A POPULAR INN SINCE THE BEGINNING OF THE EIGHTEENTH CENTURY. THE ORIGINAL FORESTER'S HOUSE WAS BURNED IN 1915 AND REBUILT A YEAR LATER

THE TOWN HOUSE OF WILLIAM ZIEGLER, JR., ESQ.

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

BY

MATLACK PRICE

TO every discerning architect must come the time when he discovers that architecture is not satisfying if it fails to go beyond mere correctness,—correctness, that is, which has to do with the accuracy with which he has transcribed this or that moulding. Scholarly carefulness, no matter how fine, comes to seem inadequate. Imagination is not involved, or good taste,—and of these two all true architecture is found, in the end, to be compounded. Because this is so, imagination and good taste often make up most of the difference between really distinguished architectural performance and that which may be good but quite undistinguished. It may even be unfortunate that good taste is often a gift rather than an acquisition. If it could be easily acquired, we might see more of it,—but as things are, it is in no danger of becoming commonplace. All of which prefaces a few words regarding a recently built house designed by William Lawrence Bottomley, an architect whose work I have always felt to be marked by essentially good taste. The Ziegler town house is definitely American in its major characteristics, with a certain cosmopolitan urbanity in the whole manner of its rendering. Of brick exterior, with paneled shutters and a fine Georgian doorway, the broad entrance foyer at once bespeaks a definite American lineage. The cornice derives from the old Congress Hall cornice of Philadelphia, and two stone Ionic columns suggest something that Jefferson might have done in the Classic manner of Monticello. The built-in paintings are French, of the early eighteenth century, by Forbin, entirely in character with the sort of thing which might have been brought over in Revolutionary times for the adornment of the fine house of a gentleman of taste and means. Beyond the circular stair well, which runs the entire four

Entrance Hall, House of William Ziegler, Jr., Esq., New York

William Lawrence Bottomley, Architect

OWNER'S BEDROOM

GUEST ROOM BATH ON THIRD FLOOR

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

LIVING ROOM TERRACE ON SECOND FLOOR
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

flights to the top of the house, there is a beautifully done "powder room," much in the manner of the Empire without being too insistently stylized. Spacious closets are built behind concealed doors painted by Mrs. Joseph B. Thomas in the manner of old *grisaille* wallpaper, with a panorama of very early New York. Here the utmost smartness and sophistication have been achieved wholly without affectation.

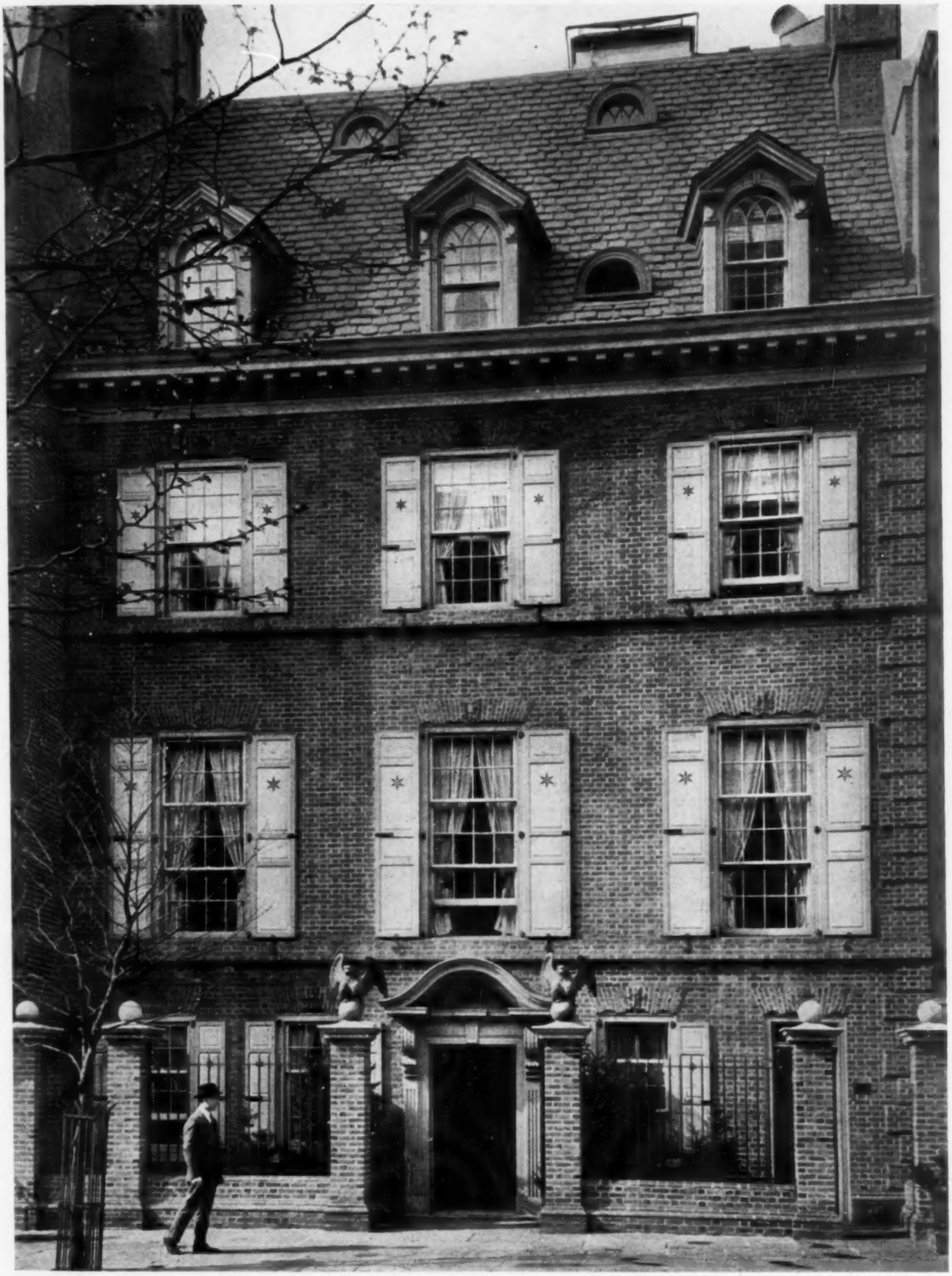
Au premier etage. The hall gives toward the front of the house into the dining room, and toward the rear into the sitting room. The dining room is long and dignified, faithfully detailed from the old Beekman house. Mr. Bottomley had impressions made of the mouldings and other ornamental details, and these are executed in a manner thoroughly in accord with the feeling of the original work. Here is a dining room that is a serious and significant addition, like Grosvenor Atterbury's work in the New York City Hall, to the best of our re-creations of Georgian Colonial and early American interiors. In the large sitting room there is a full realization of the opportunity for fine spaciousness that is afforded by the wide city plot on which the house is built. The room is an old deal room from England, an original, astoundingly like, in detail, to the Beekman interior on which the dining room was based, being, in fact, an architectural contemporary. It is a handsome room, a fit setting for its fine paintings, such as a landscape by Gainsborough. Architectural ingenuity has further provided concealed incidents which would surprise the original designer of the room. One door, for instance, conceals a complete lavatory in old Dutch tiles; another reveals a complete radio equipment, and small panels, when opened give access to winches for lowering the great Waterford glass chandeliers, so that they may be cleaned without mounting tall step-ladders. The sitting room windows open upon a pebbled terrace with a fountain, and as this terrace is laid out on an extension of the service quarters below, it looks down, in turn, upon the garden that occupies the remaining portion of the premises and toward the facades of other houses.

The third floor is given over to charmingly furnished guest rooms, with faultlessly appointed baths and dressing rooms, in every detail of which ingenuity is combined with good taste. One realizes at this point, how the good taste that pervades the whole house has kept any one room or any stylistic mannerism from being insistent or over-architectural, and is reminded, perhaps, of the definition of the really well dressed man, of whose apparel every detail is in such good taste that one cannot remember, at first thought, exactly what he was wearing. The fourth floor, by choice, is occupied by the owner's apartment, with charmingly designed dressing rooms and baths. Concealed closets with trays and hanging space are ample,—and are invariably planned with unobtrusive ingenuity. Every comfort or convenience caters to pleasant living in a charming environment. Can any architect, by any possible means, accomplish more?

Dressing Room on First Floor

The details of interior decoration were carried out by Mrs. Cameron Tiffany, in collaboration with Mr. Bottomley. Everyone who is at all familiar with Mr. Bottomley's work must think of him as, himself, a decorator of peculiarly marked abilities as evidenced in his invariable combination of knowledge and good taste. There is never anything unstudied or unfinished in his work.

Editor's Note. In these days when so many of the younger architects are spurning and discarding all use of precedent in their designs, it is both gratifying and reassuring to find one of our foremost younger architects using Georgian precedent with such complete success. Although purely English Renaissance in every detail, this house of Mr. Ziegler's shows unusual originality and inspiration. It is a perfect example of the way architectural precedent should be studied and adapted to modern requirements. Particularly is it true in domestic architecture that designs carried out under the influence of the modernistic school are deplorably lacking in those qualities which make for liveableness, charm, satisfaction, and the all-important quality of hospitality, which, for the past two centuries, have been characteristic of the finest domestic architecture in England, France and America. To most of us, the bizarre, grotesque and ascetically rectangular interior architecture and furnishings of the modernistic house are distressing.

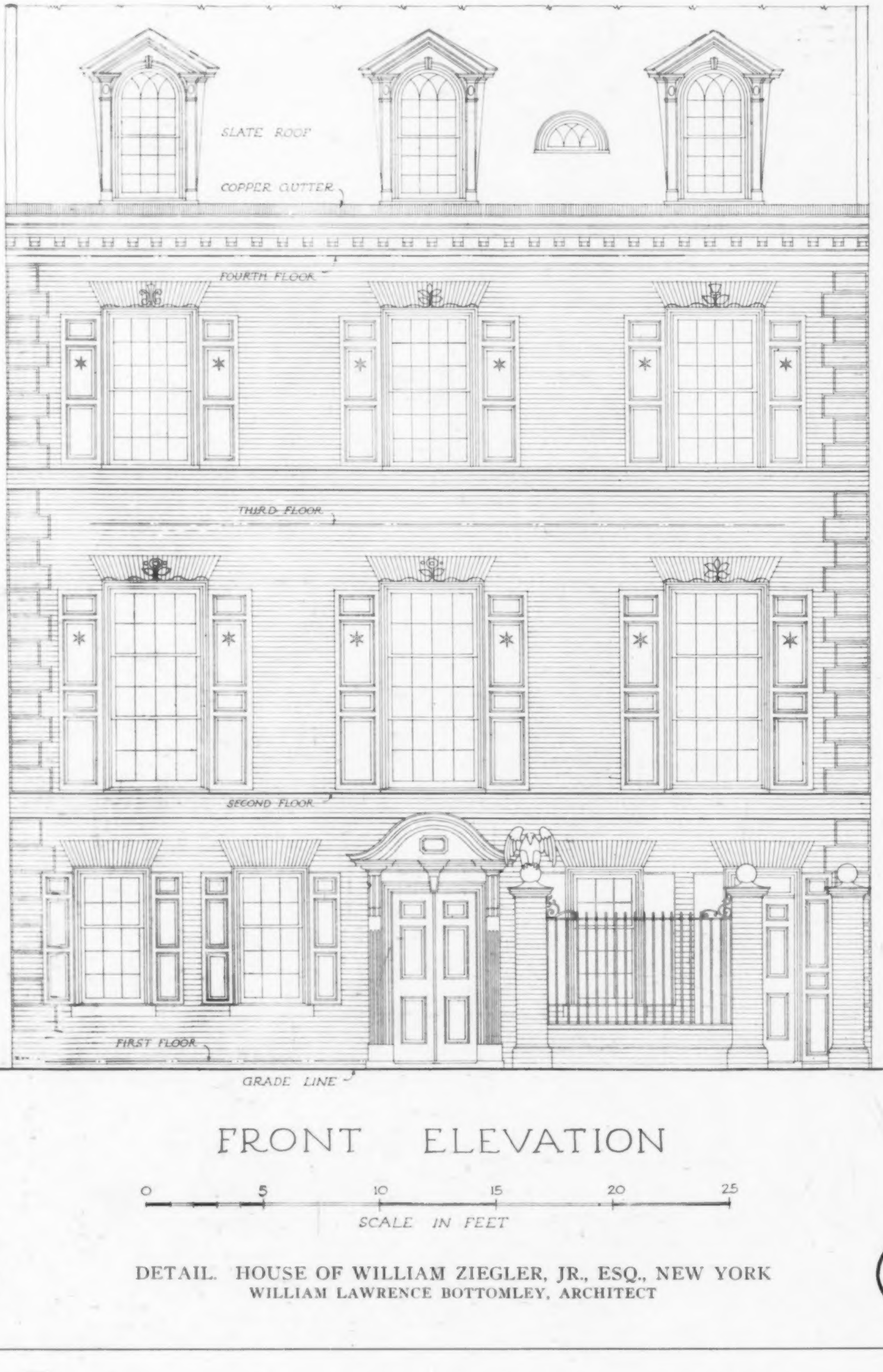


Photos. Sigurd Fischer

Detail on Back

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



FRONT ELEVATION

0 5 10 15 20 25
SCALE IN FEET

AUG. 1928

DETAIL. HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

No. 75

The ARCHITECTURAL FORUM DETAILS

Detail on Back

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

ENTRANCE DETAIL

SCALE IN FEET

1 0 5 10

AUG 1928

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

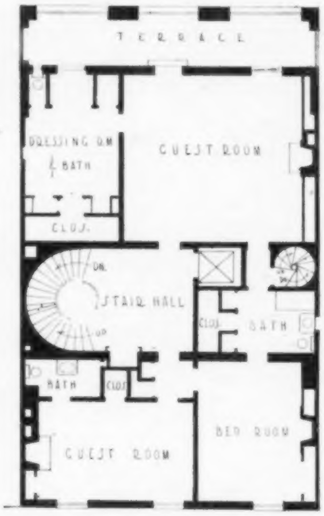
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

No. 76

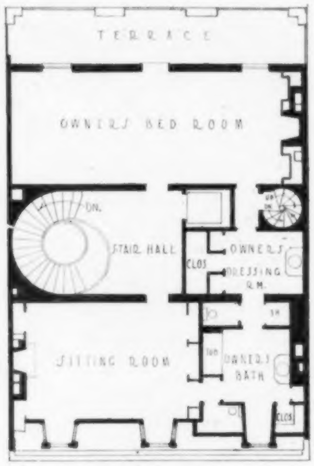
The ARCHITECTURAL FORUM DETAILS

Plans on Back

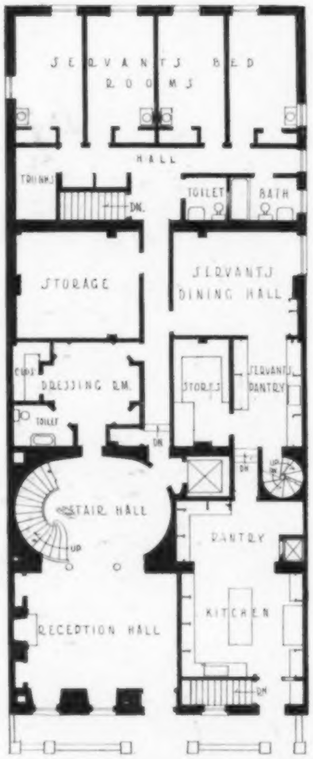
LIBRARY
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



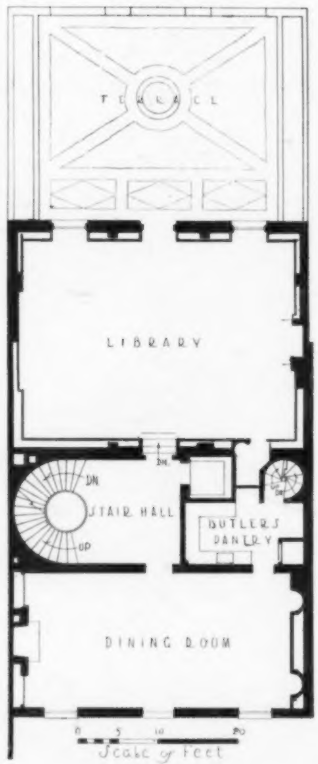
SECOND FLOOR



THIRD FLOOR



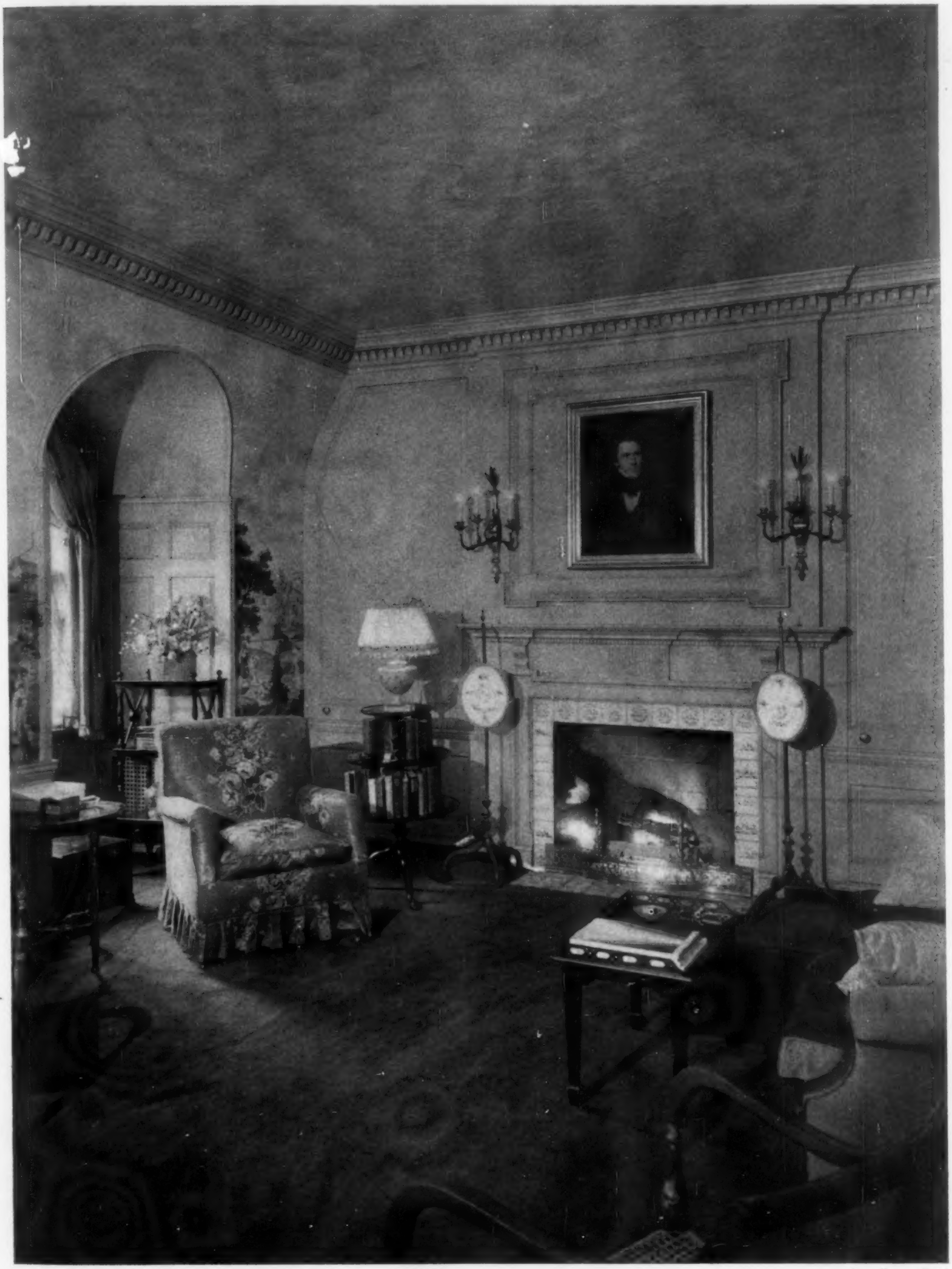
ENTRANCE FLOOR



FIRST FLOOR

PLANS. HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

LIBRARY
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



Details on Back

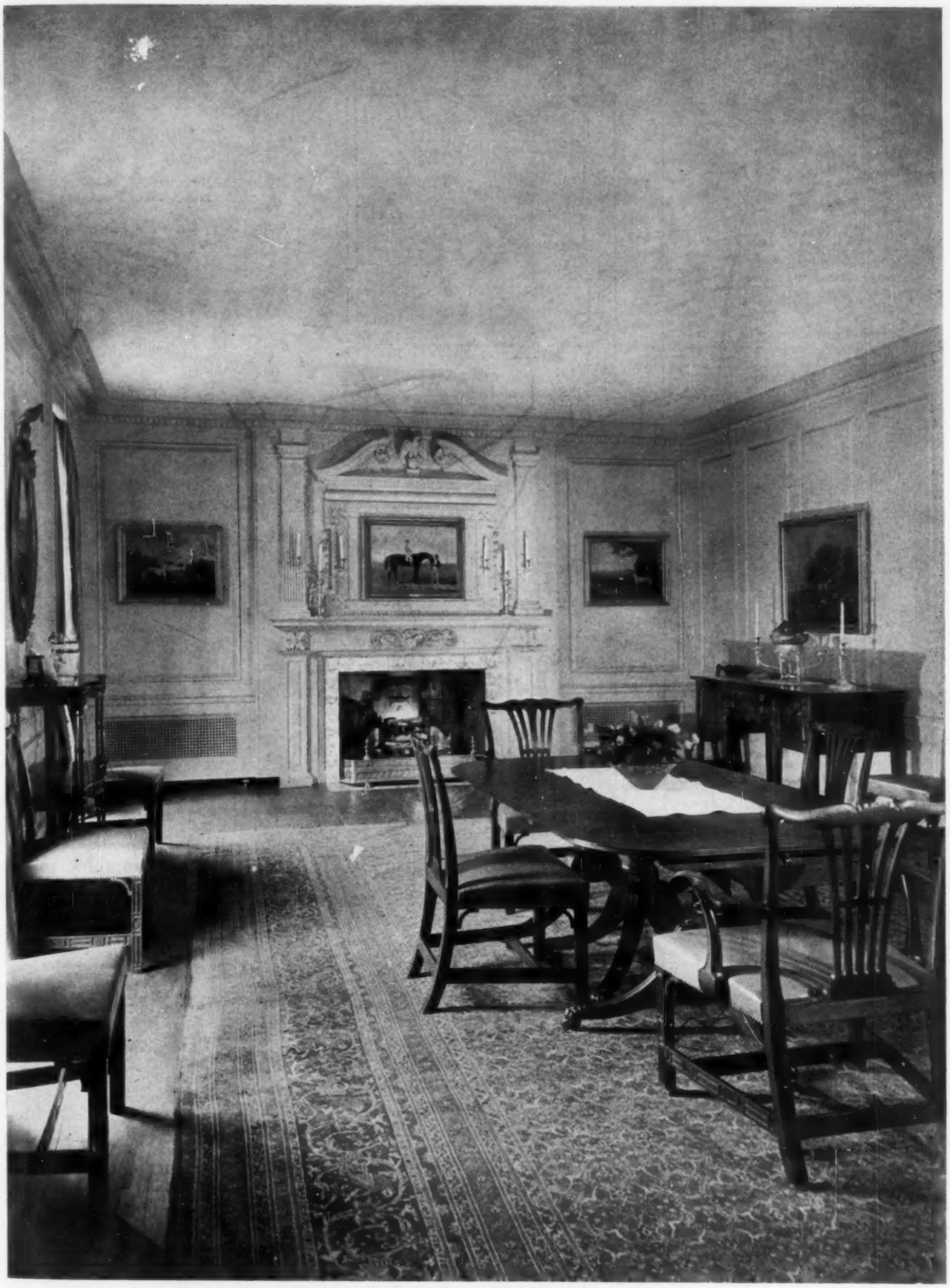
SITTING ROOM
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

AUG 1928

No. 77

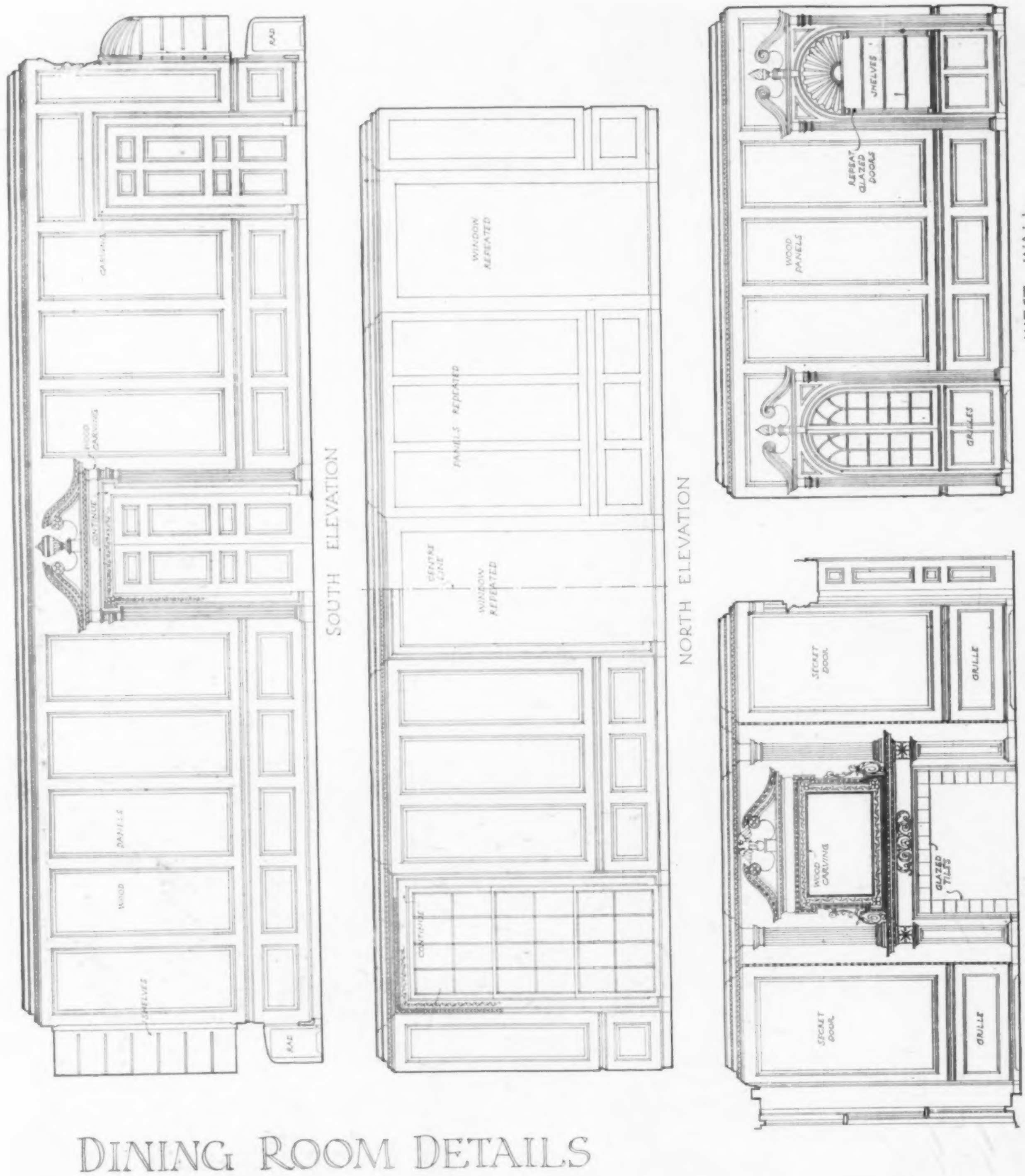
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

The ARCHITECTURAL FORUM DETAILS



Details on Back

DINING ROOM
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



DINING ROOM DETAILS

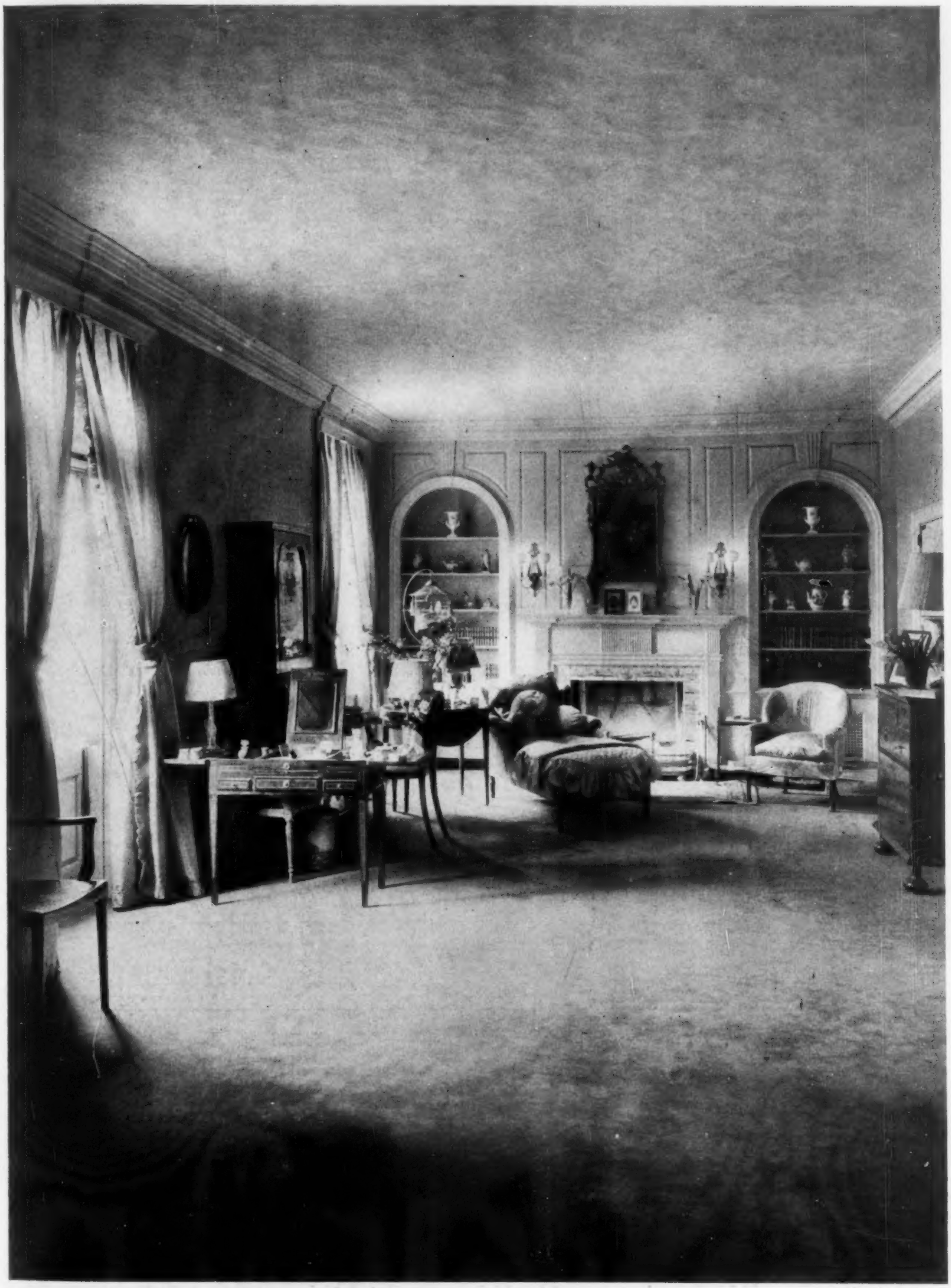
AUG. 1928

0 5 10 15 20
SCALE IN FEET

No. 78

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

The ARCHITECTURAL FORUM DETAILS

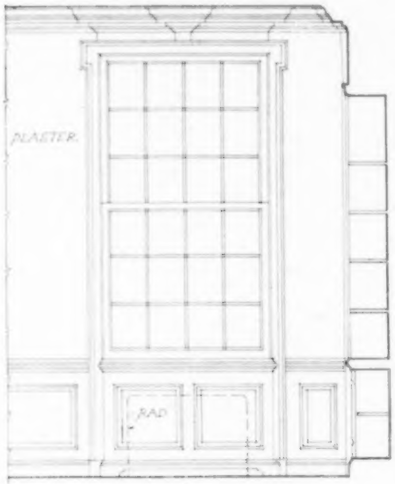


Details on Back

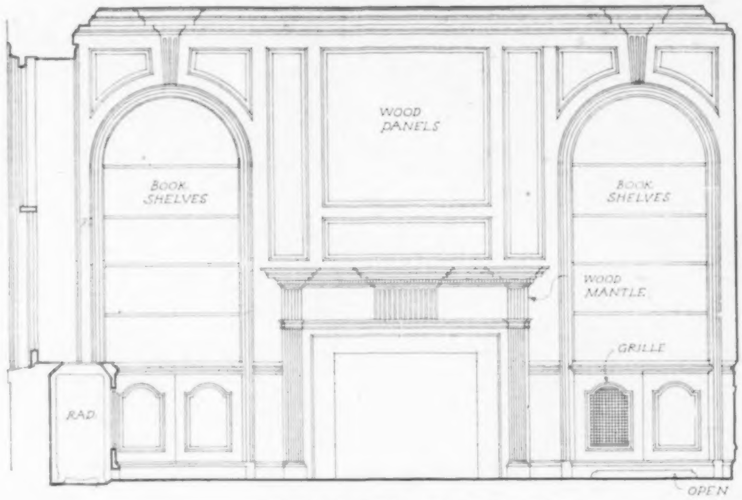
OWNER'S BEDROOM

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

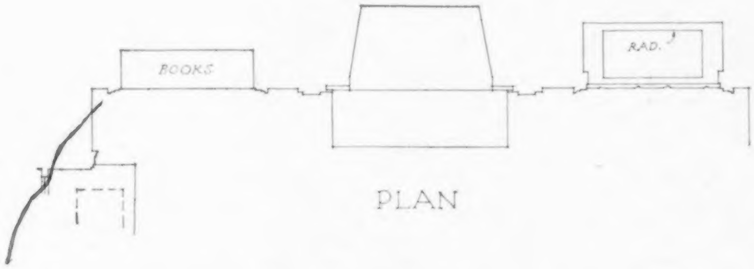


PART OF
SIDE ELEVATION

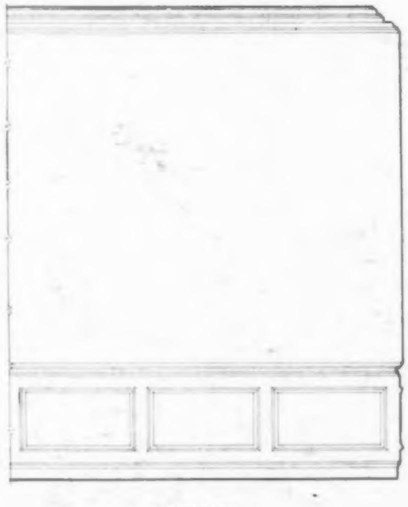


FIREPLACE ELEVATION

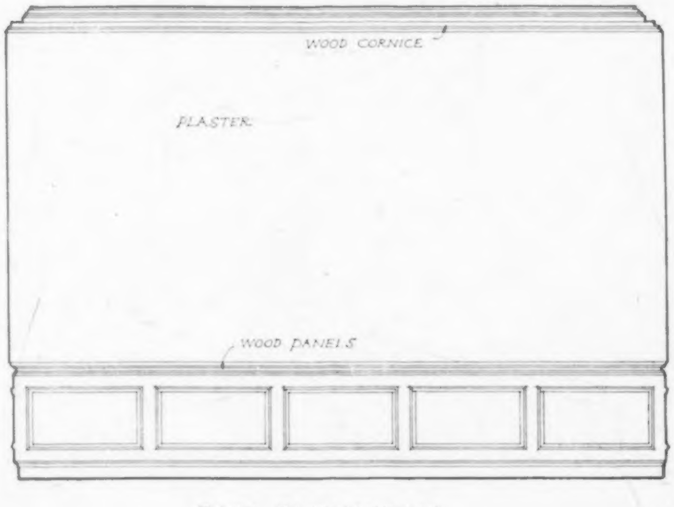
DETAILS of OWNER'S BED ROOM



PLAN



PART OF
SIDE ELEVATION



END ELEVATION

SCALE OF FEET

AUG. 1928

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

No. 79

HALL ON SECOND FLOOR
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

THE FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

HOBART B. UPJOHN, ARCHITECT
BY
OTTO F. LANGMANN

REGARDLESS of whether it be faith, reason or circumstance that induces man to accept his religion, there is still the subtle matter of setting or "atmosphere" to be reckoned with in his selection, and it is the architect's privilege, as well as his difficult problem to supply this intangible and evasive thing, usually with forms and materials that are familiar, for in churches, above all else, our art bids us be conservative, using only what might be proper.

Knowing success to be dependent directly neither upon size or proportions nor richness of materials and yet, on the other hand, being uncertain as to its contributing causes, the architect welcomes with joy an opportunity such as was afforded in the case of the First Baptist Church at Plainfield, N. J. With its walled flower garden and willow and pine trees, the plot itself had so much charm that the success of any architectural composition to be placed upon it seemed reasonably assured. The history of this church is so interesting that it is worth while recording some of the salient facts. The earliest Baptists of this community worshiped in a meeting house at Scotch Plains, built in 1742. From it came men who in 1792 founded Samptown Church, two miles south of Plainfield, and from this, in turn, sprang the First Baptist Church at Plainfield. At the time of its organization, it had 34 members, and its pastor, the Reverend Jacob Fitz Randolph, drew the munificent salary of $250 per annum. Considering that the town of Plainfield at this time numbered 250 inhabitants, this represented an expenditure of exactly one dollar per person in the cause of religion. It would be interesting to know the cost of building in those days, but unfortunately the record of whatever assessment was made of its 250 citizens is not preserved. The original meeting house was a plain rectangular frame building, without spire or other marks to distinguish it as a place of worship. Later on, however, there were added such elements, first a bay at the rear, in 1837, and then a portico with square columns and a cupola in 1843. As the size and wealth of the congregation increased, the building became too small and modest in appointments and so, in 1868, it was moved to the rear of the lot while a new edifice was erected of local stone. This building endured, without change, until 1923, when a disastrous fire rendered the congregation homeless.

After considerable deliberation and delay, it was decided to move to a new site, and the residence and garden now incorporated into the "plant" were purchased. Furthermore, those in charge of the new building program instituted a competition among a limited number of architects in the belief that this procedure would insure the best results, and the new church represents the winning design of this competition. The program as written called for the incorporation of the residence on the site into the general scheme, which meant, since Colonial was the style employed, refacing it with a veneer of brick and cutting back the projections of all cornices. The

Photos. Mattie Edwards Hewitt

First Baptist Church, Plainfield, N. J.
Hobart B. Upjohn, Architect

FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

Parsonage, Sunday School and Close, First Baptist Church, Plainfield, N. J.
Hobart B. Upjohn, Architect

finished building testifies to its complete success.

The plan of the group is of U-shape, with the Sunday School at the back, flanked by the church at the right and the church offices at the left. The old encircling brick wall was retained, although it had to be reduced in height so as not to be a menace to traffic. Even in its altered form, however, it contributes to a seclusion that is rare with modern churches. The church, with its slender spire and high nave windows, dominates the design, the Sunday School being low, somewhat in the manner of the dependencies or outbuildings of Colonial residences. The church auditorium is a simple rectangular room, without columns, but with a balcony at the rear and a slightly curved ceiling. The organ is placed on the main axis of the room, in the chancel immediately above the baptistry, while the singers occupy stalls, two on either side of the chancel. The organist is placed in a gallery, behind the choir stalls and within reach of members of the choir to permit the passing of sheet music or notes. By a mandate of the competition, the organ had to be placed back of the pulpit, and it quite dominates the composition with attributary elements of baptistry and chancel furniture. Behind the baptistry are located six robing rooms, to be used at baptismal services, and at the right is a study for the minister for use immediately before and after service. The Sunday School, lying in the wing at right angles to the church, contains the Beginners', Primary, Intermediate, Senior and Young People's departments, consisting of small classrooms and their respective assemblies, and a large room for general assembly called the "Fellowship Hall." Two large fireplaces emphasize the social note of this room, while a stage and projection room allow for dramatic entertainments. A large, well equipped kitchen, capable of preparing meals for 250 people, is adjacent to the Fellowship Hall. The residence formerly on the site has, as was already said, been much altered on the exterior, whereas the interior was only slightly changed to meet the needs of the executive branch of the church organization. The minister's study, women's parlor and various offices, some of which can be also used for meetings of classes on Sunday, are located here, easily accessible from the street; and by virtue of the fact that this was once a residence, the rooms which they occupy are free from any touch of the "institutionalism" which so easily creeps into the design of a regular office building.

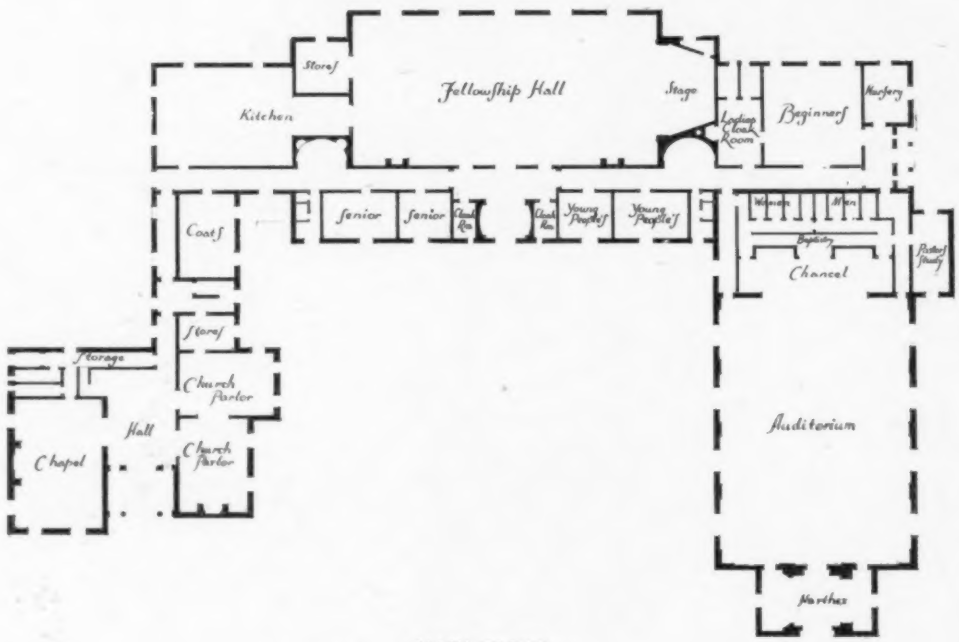
As to the decorative color scheme employed throughout the group, this adheres strictly to precedent, in that the woodwork, except for doors of mahogany, is of ivory. The walls, however, are treated in pale colors, varying from blue in the Fellowship Hall to green in the Primary, and from tan in the Beginners' Room to a warm, grayish buff in the church auditorium. Draperies in practically all the rooms, appropriate decorations on the lamp shades, and chairs in the small children's rooms, and the presence of a flower box here and there, together with the light colors of the walls, afford a note of cheerfulness blended with that cleanliness so proverbially akin to Godliness, giving an impression in absolute contrast to that of the gloomy and stuffy churches of an age not so long gone by. Brick, marble and wood are the materials employed in the walls, use being made of a local brick from South River, N. J., closely resembling that used in colonial times. Cornices, pilasters and the spire are of wood.

Photos. Mattie Edwards Hewitt

Plan on Back

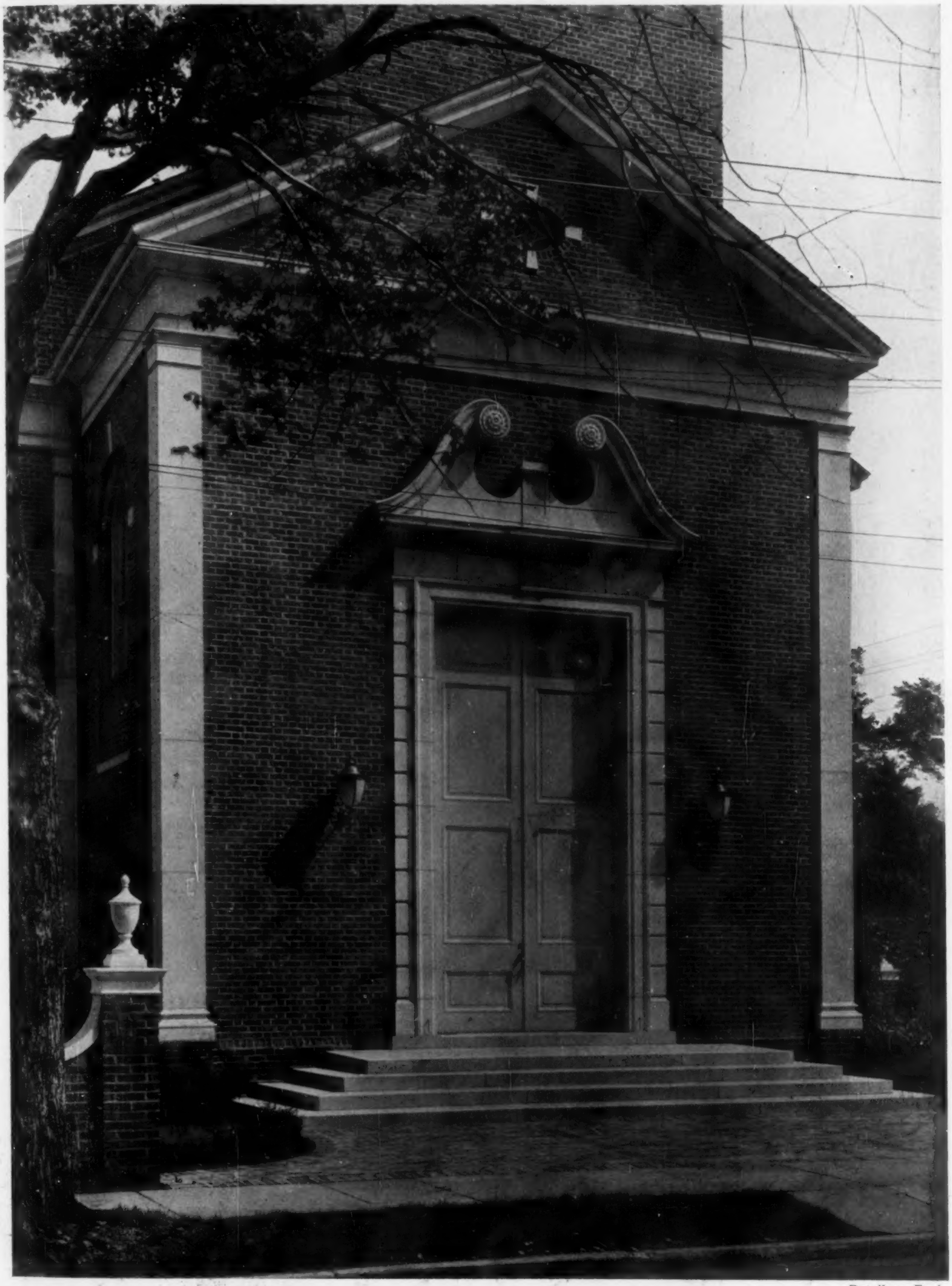
FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

HOBART B. UPJOHN, ARCHITECT



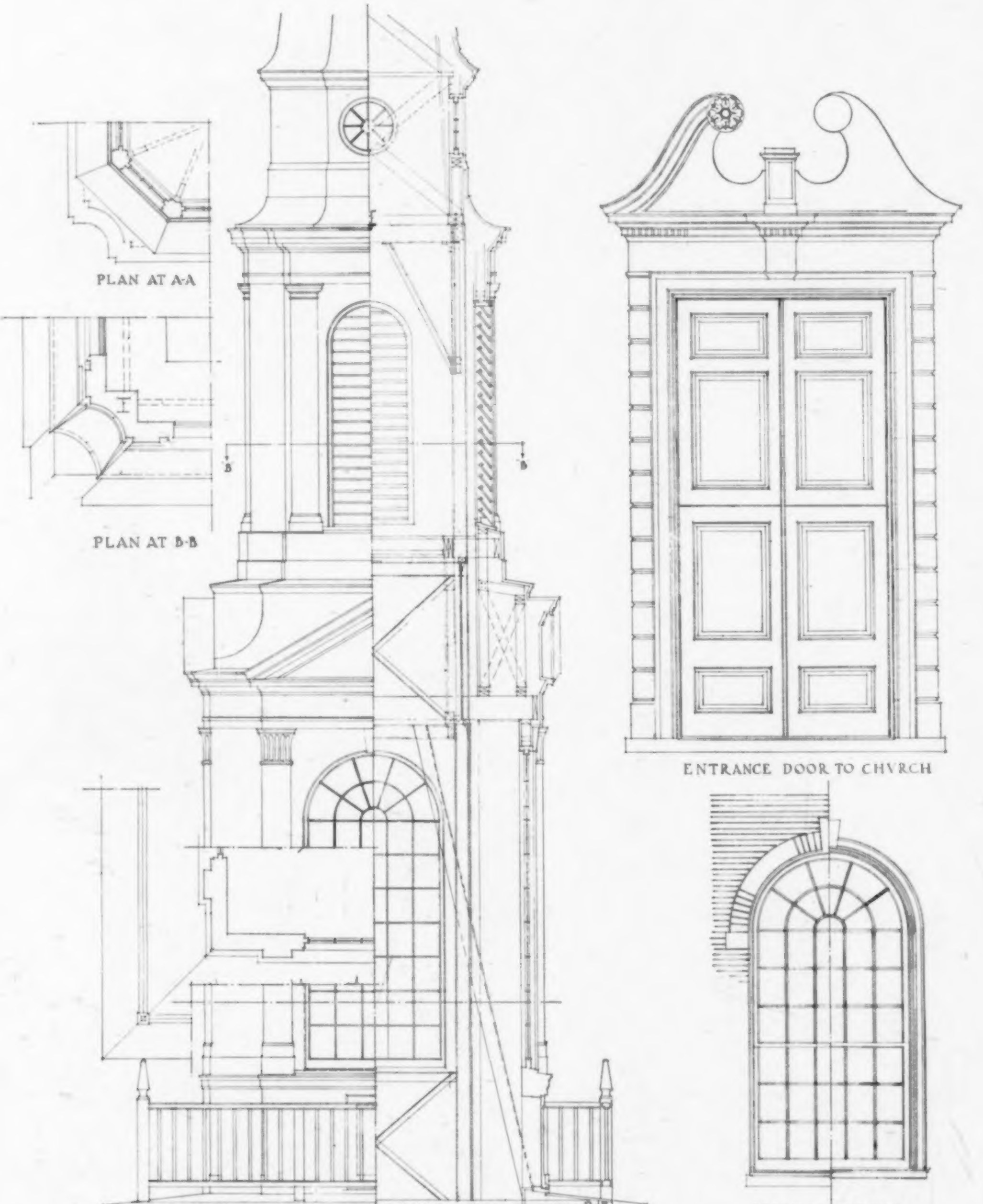
MAIN FLOOR

PLAN. FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

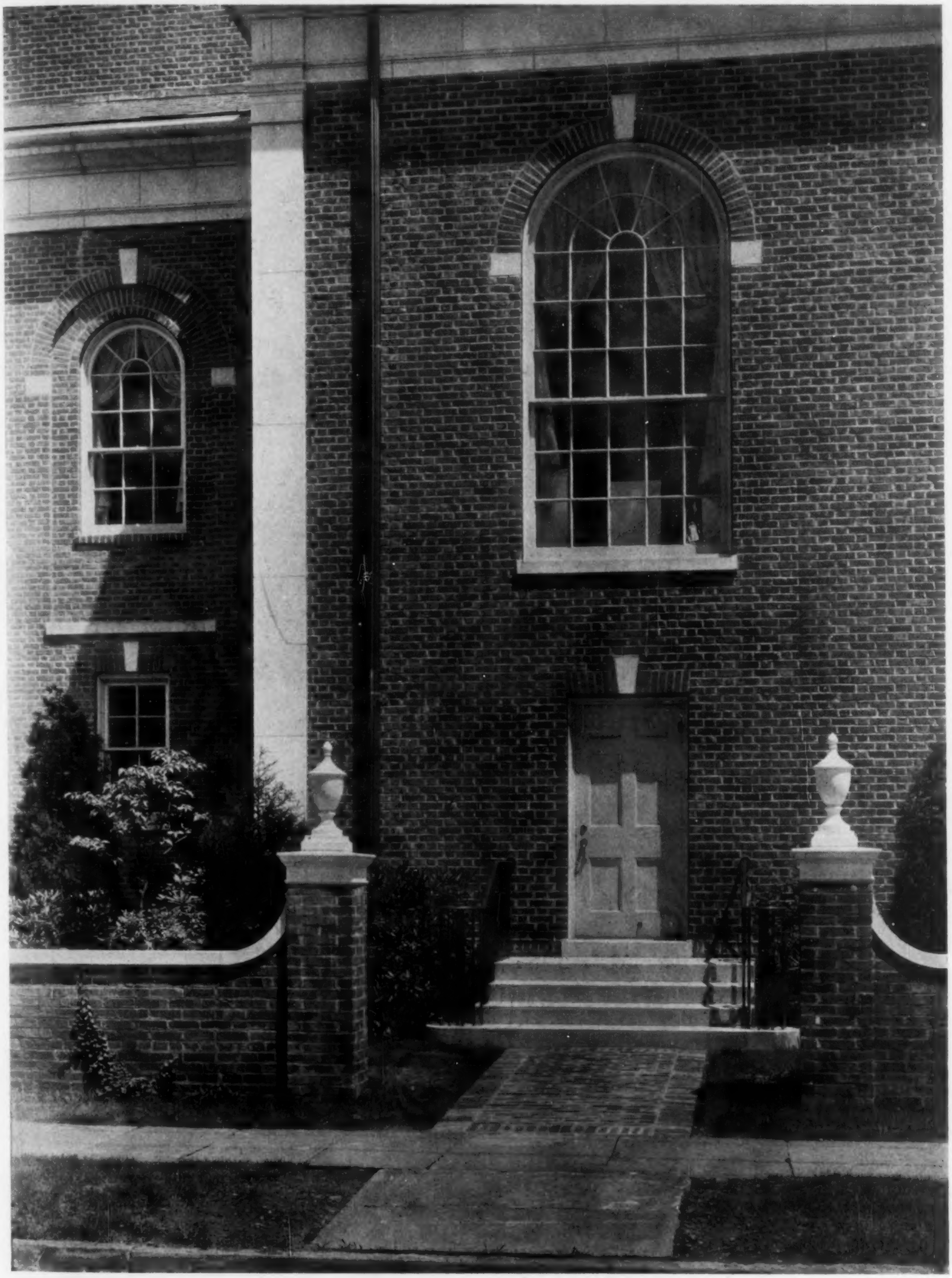


Detail on Back

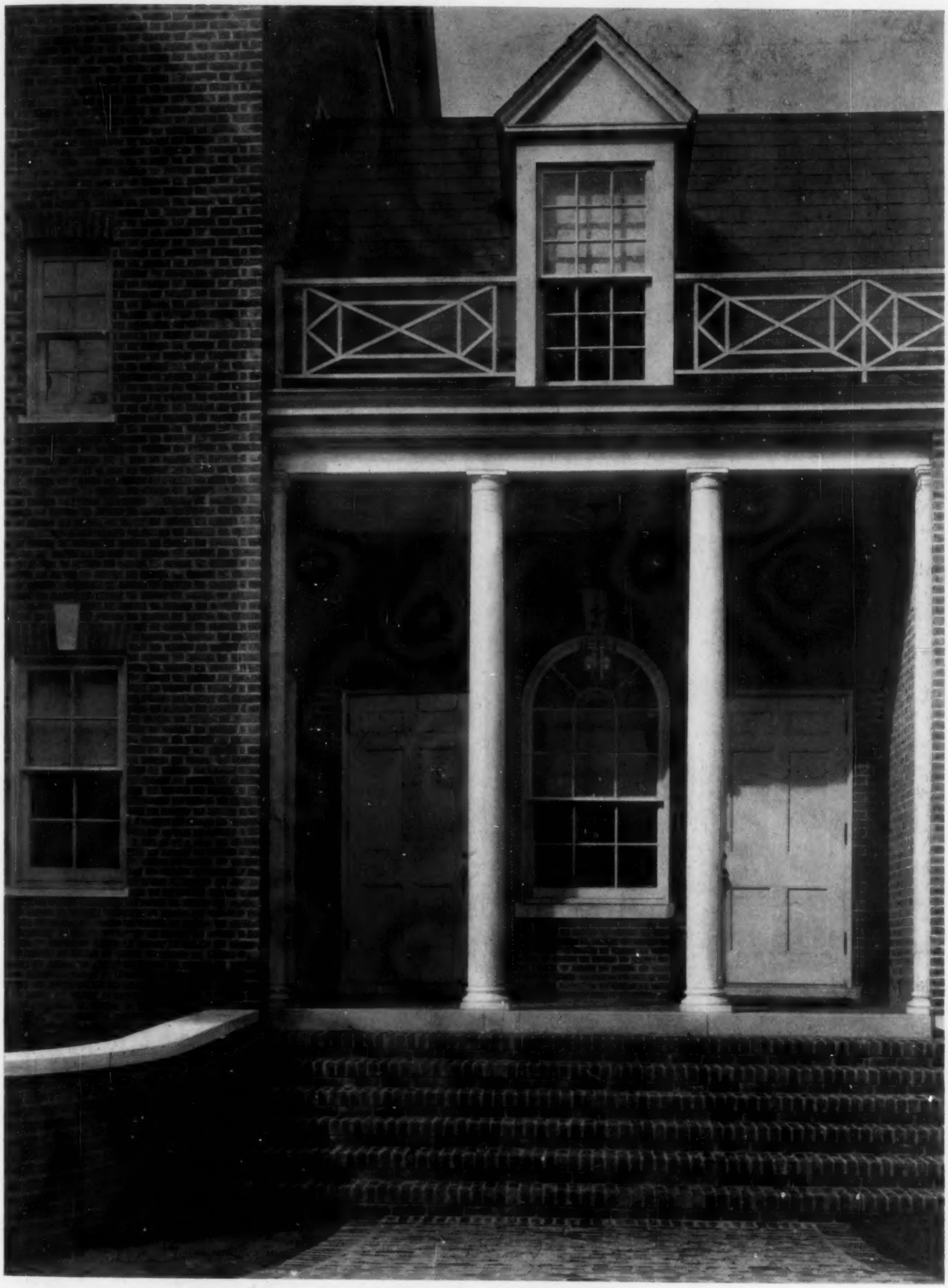
FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT



DETAILS. FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT



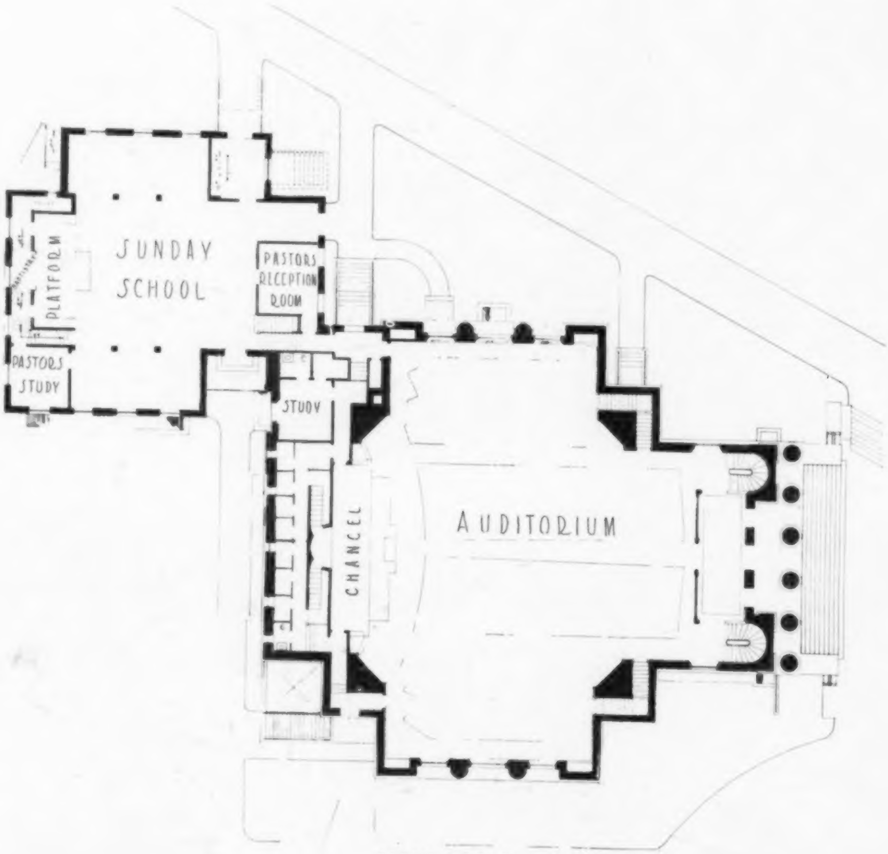
FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT



FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

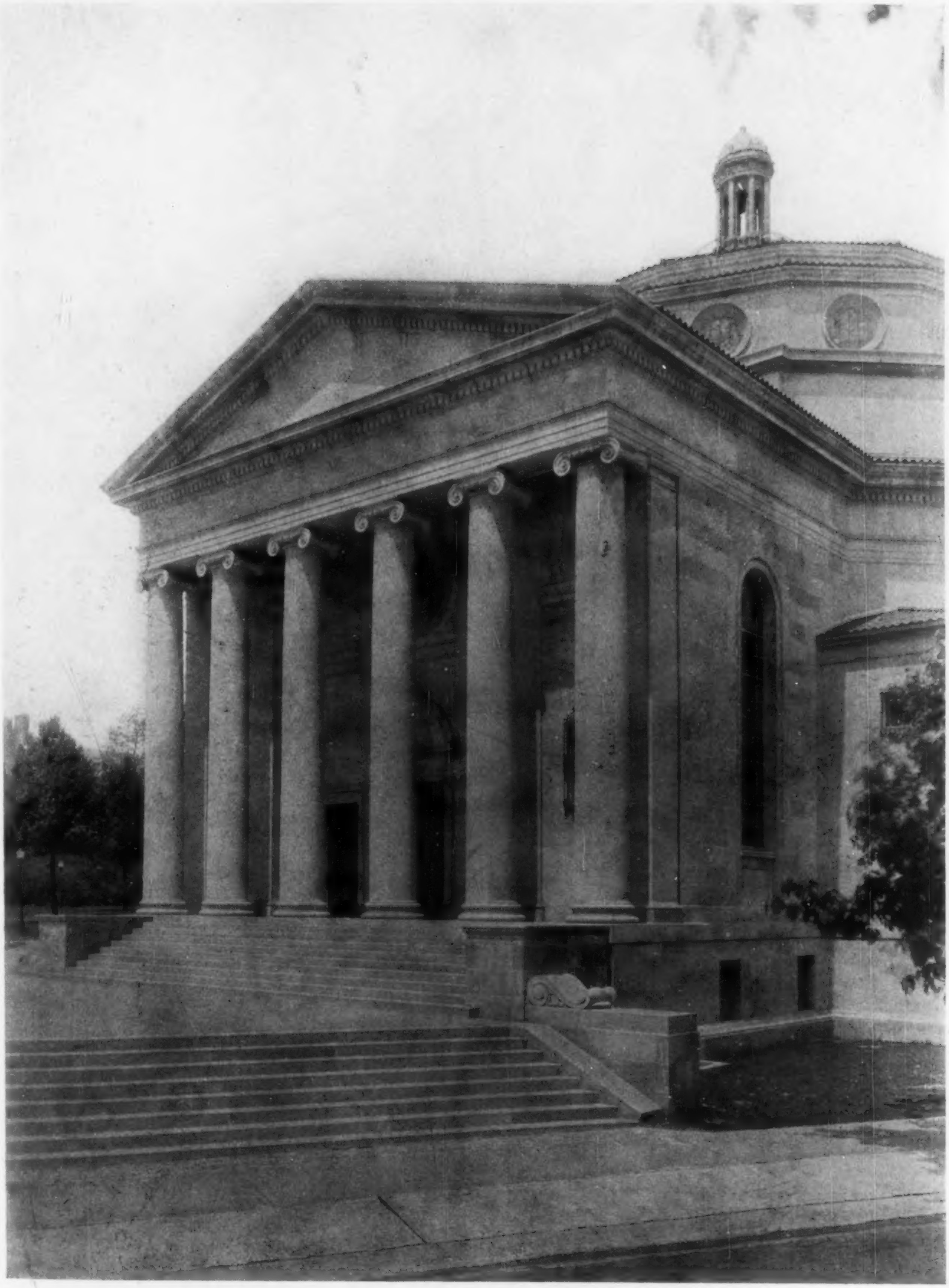
Photos. John Wallace Gillies, Inc. *Plan on Back*

UNIVERSITY BAPTIST CHURCH, BALTIMORE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

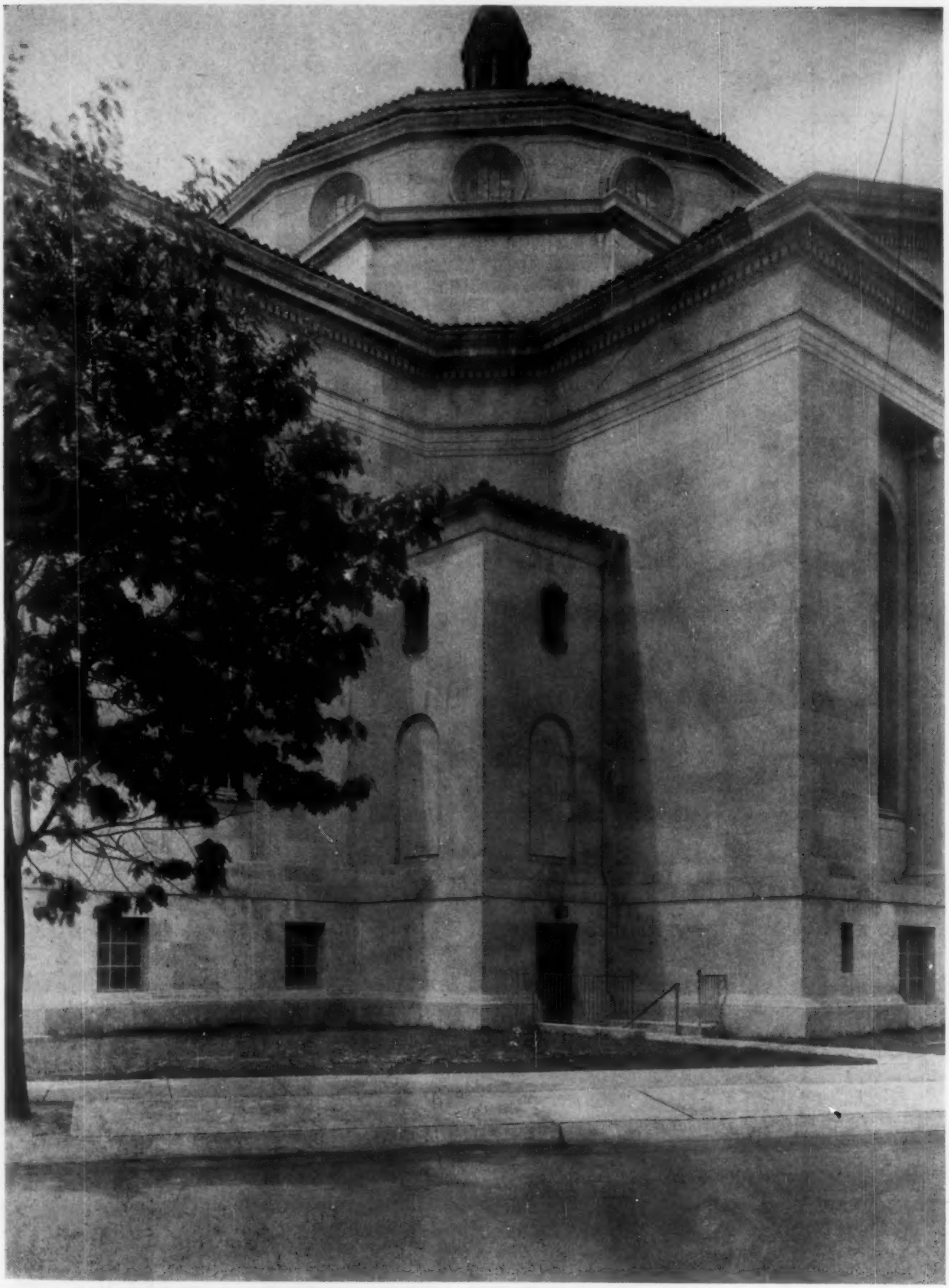


MAIN FLOOR

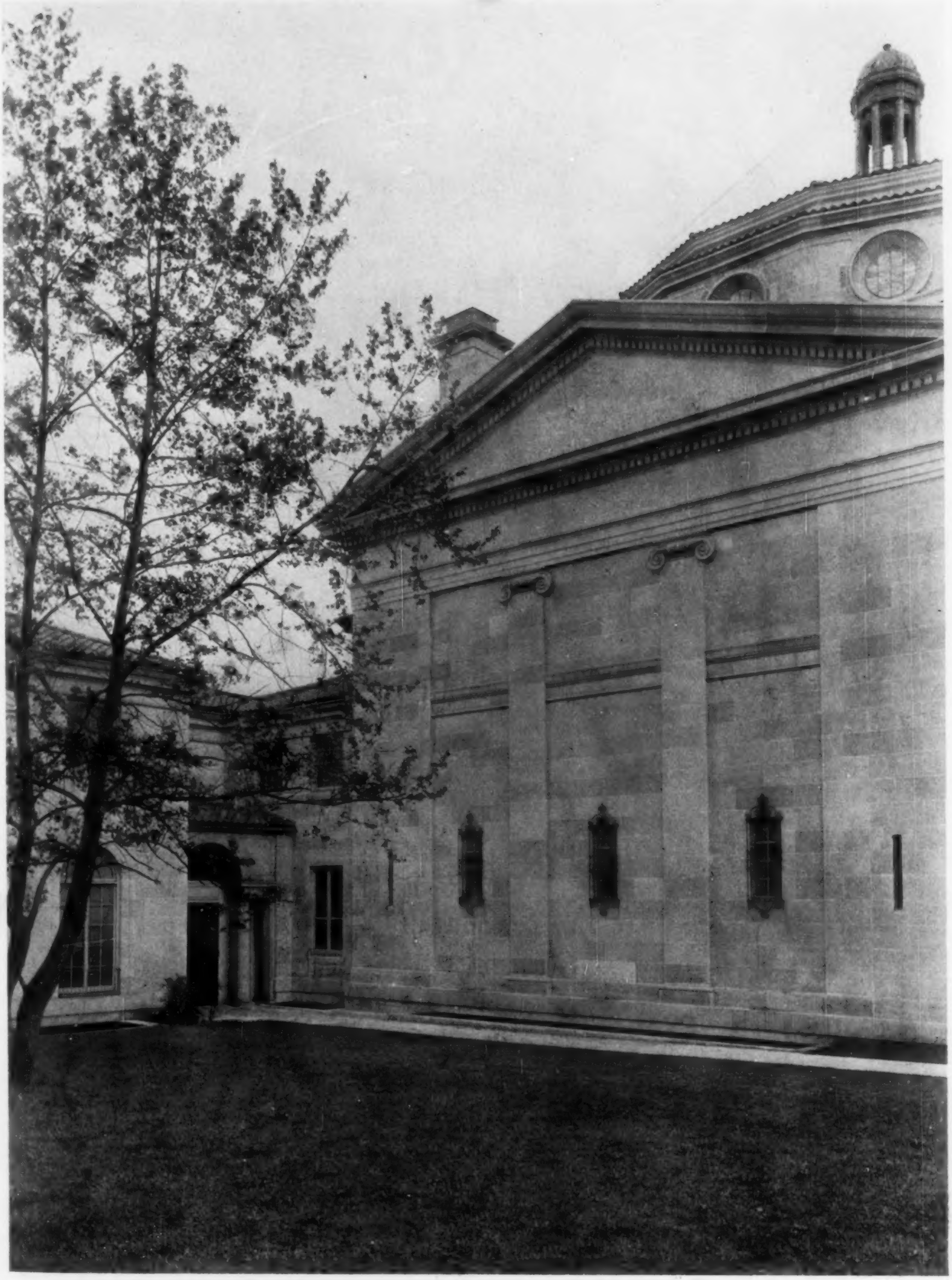
PLAN. UNIVERSITY BAPTIST CHURCH, BALTIMORE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



UNIVERSITY BAPTIST CHURCH, BALTIMORE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



UNIVERSITY BAPTIST CHURCH, BALTIMORE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



UNIVERSITY BAPTIST CHURCH, BALTIMORE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

SOME DOMESTIC WORK OF BAILLIE SCOTT

BY

WILLIAM PATTERSON

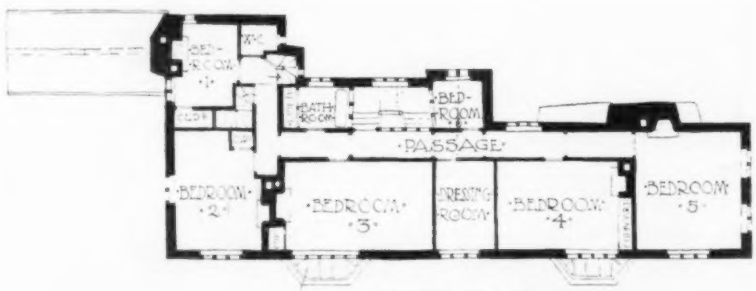
AMONG those who admire modern domestic English architecture of the more picturesque and romantic school, the name of Baillie Scott is indeed well known. Gifted with much originality of thought and with considerable skill in the matter of design, he has built many English homes, large as well as small, which may well be passed on to coming generations of Englishmen as excellent examples of the best in the way of present-day design and craftsmanship. Mr. Scott's design excels, first of all, in the matter of grouping structures. With a high regard for symmetry and usually for balance, he disposes the masses of his buildings in ways which satisfy one's sense of proportion without involving a formal disposition of similar parts upon either side of an axis. Then, too, he has inherited from earlier British architects that almost unerring instinct for the combining of different architectural elements in ways which seem to be logical and the result of carefully thought out planning, even when, as has frequently happened, the combining has been wholly fortuitous. Then there is the highly important matter of roof lines, Mr. Scott's being long, simple and flowing, giving to a structure the harmony and symmetry of a tree with its low and spreading branches close to the ground. His houses are designed with particular reference to their sites, and thus, for one reason, they possess that strong individuality which is one of the distinguishing marks of his work. So too in the matter of chimneys, for whether they be placed singly or grouped into stacks, they add to the buildings' masses and restful roof lines just that degree of accent which well disposed chimneys should supply, but which often they do not.

In an old country such as England, which has been growing for centuries and which is made up of many counties, towns and hamlets inhabited by people possessing widely different social traditions and methods of building, there persist of course countless architectural types and uses of materials, and these types and uses cling to and are suited to their localities in a particular way. A house which might be admirable in Yorkshire would be quite out of place if built in Surrey or Sussex, just as in much the same way a northern New England Colonial house would be entirely unsuitable in Florida or California. The Yorkshire cottages with their thick stone walls and heavy stone roofing slates, the beautiful old Cotswold houses, and the rich and mellow houses of the southern counties with their wonderful old tile roofs, mellowed and weathered by the hand of time, all give inspiration to the architect who is also an artist. The roofing tiles used in England are much more successful than most of the tiles

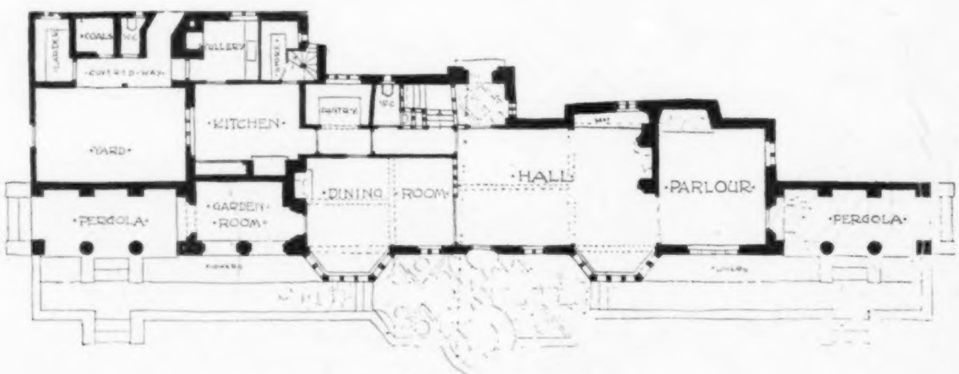
"Burton House," Longburton, Sherborne, Dorset

Baillie Scott, Architect

ENTRANCE FRONT



UPPER FLOOR



GROUND FLOOR

"HARBLEDOWN," CANTERBURY, KENT

BAILLIE SCOTT, ARCHITECT

"The Tudors," Gerrards Cross
Baillie Scott & Beresford, Architects

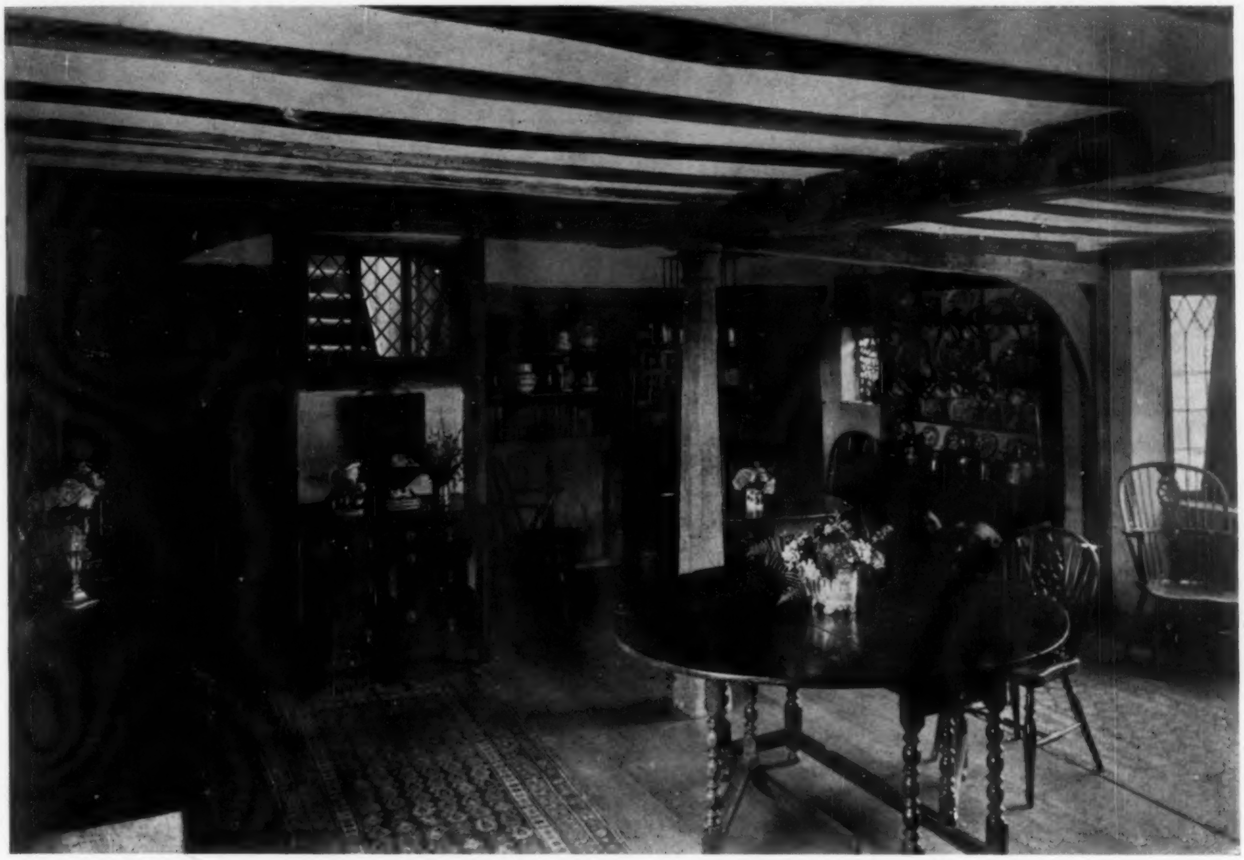
we find in America. Hard, smooth tiles always give a roof a monotonous and stereotyped appearance.

After receiving an invitation from the owner of "The Tudors," Gerrards Cross, Bucks, to visit the place, I was strolling around the district in which the house is built, trying to pick up some worthwhile houses to photograph. I found a good many thorns and only a few roses. Suddenly rounding a corner in a bend in the road there appeared a mass of roof lines which at once suggested Baillie Scott, a house of more than usual distinction, the sort of place one often thinks about and wants to see but seldom finds in actual life. A few moments later the whole entrance front came into view. I felt like a tired traveler arriving at his destination and finding himself suddenly standing in front of a charming old inn, with a feast spread before him. In the late afternoon of a long English summer day, with the gradual approach of twilight and the softening shadows falling over a rolling countryside, there comes an atmosphere of peace, quiet and contentment; I had caught "The Tudors" at its best. In England the early morning, after sunrise, and the fading twilight are the times when the countryside is most appealing. The house, garden, surrounding scenery, and occupants of "The Tudors" all seemed to fit in together and to produce the feeling of a truly old English home with real atmosphere both inside and out, while their personal welcome made me feel that there still exist in England that cordiality and friendliness which one often feels lacking nowadays under more modern ways and methods of living and more modern ways and methods of living and thinking, perhaps more particularly since the World War.

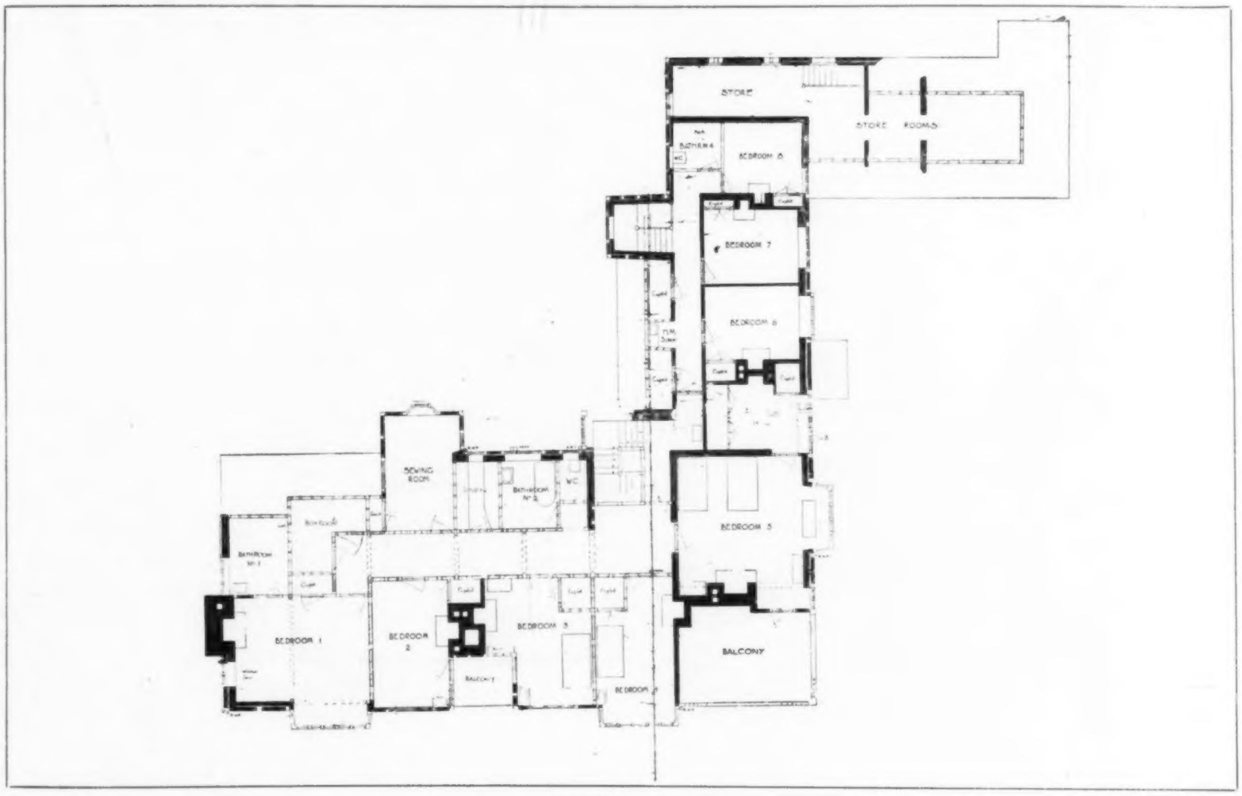
Surrounded by much picturesque country, "The Tudors" is some 18 miles from London,—by express train 25 minutes is the time from Paddington to Gerrards Cross. Two miles away is Old Jordan's Meeting House, a delightful spot, well known to many visitors on this side of the Atlantic, since William Penn is buried there. The entrance porch of "The Tudors" reminds one of some of the old buildings in the southern counties of England, where we see those wonderful old bits of building that make our flesh creep when we think of most of the modern so-called "half-timber effects." There is only one way in which half-timber construction can be successfully carried out, and that is in the good old fashioned European way,—by using plenty of solid timbers and lots of hand labor. Pieces of wood spiked onto a wall, especially on the face of a brick wall, are at best only a fake. An illustration of the entrance porch is shown here, enlarged from a small photograph. The porch is fashioned out of old English oak, of a beautiful color and texture, all hand wrought by craftsmen in the village shop adjoining Old Jordan's. At the time this house was built, there were in the shop where the woodwork

MR. SCOTT'S HOUSE, "OCKHAMS," EDENBRIDGE, KENT
BAILLIE SCOTT & BERESFORD, ARCHITECTS

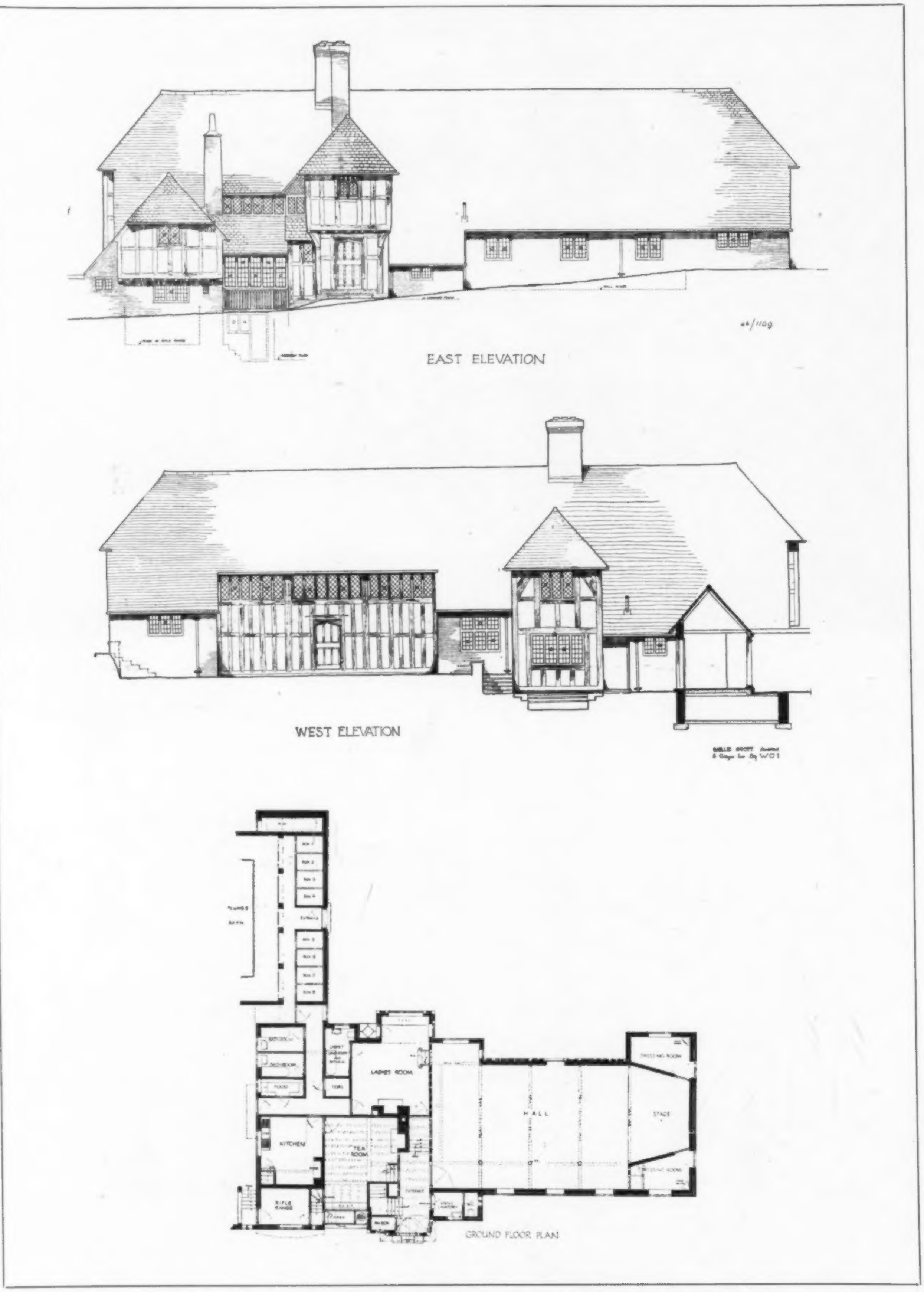
GROUND FLOOR
"THE TUDORS," GERRARDS CROSS
BAILLIE SCOTT & BERESFORD, ARCHITECTS



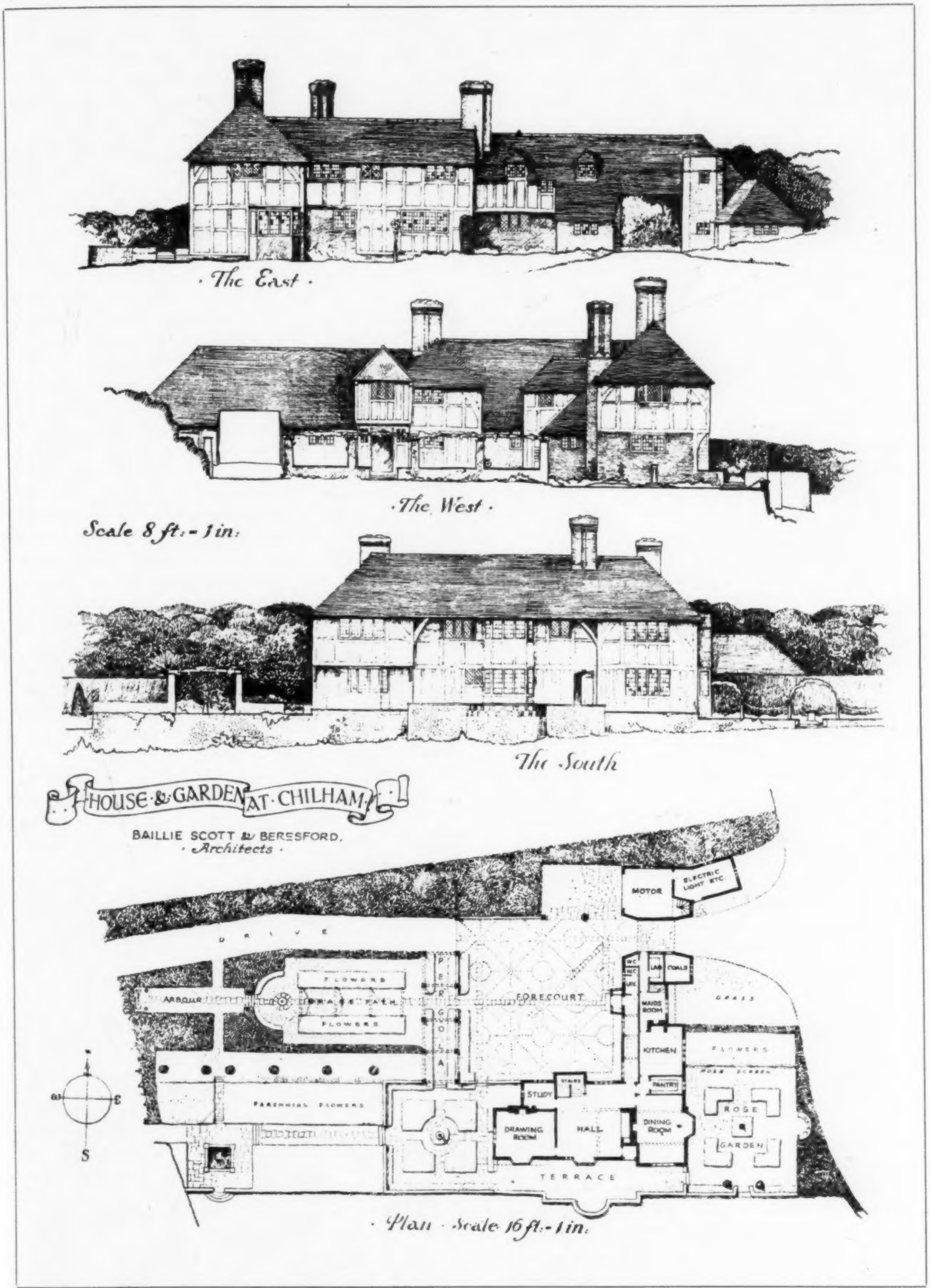
DINING ROOM IN MR. SCOTT'S HOUSE, "OCKHAMS," EDENBRIDGE, KENT
BAILLIE SCOTT & BERESFORD, ARCHITECTS



UPPER FLOOR
"THE TUDORS," GERRARDS CROSS
BAILLIE SCOTT & BERESFORD, ARCHITECTS



ELEVATIONS AND PLAN FOR A VILLAGE CLUB, IWERNE MINSTER
BAILLIE SCOTT, ARCHITECT



ELEVATIONS AND PLAN OF A COUNTRY HOUSE AT CHILHAM
BAILLIE SCOTT & BERESFORD, ARCHITECTS

was executed some of the old school type of craftsmen, men accustomed to the use of tools now going out of fashion since the introduction of standardized millwork. This type of man is rapidly dying out, and in most places he is dead already. The entrance to "The Tudors" has the appearance of age, and the gable does not look in any way mechanical. Almost all new houses have a painfully raw look; they remind one of the man who is just about to be married, uncomfortable in his usually stiff and formal new clothes. Defects of this sort can only be toned down by the hand of time and by the work of nature; to be successful, construction of this kind must be wrought by skilled hands or it will only look odd. It is merely due to the difference in handling by the artist who knows and the man who *thinks* he knows. Baillie Scott has not relied too much on the T-square, and with him the Old World has supplanted the New. Tiles taken from old buildings add very much to the appearance of the roof of the house. Hand-made, sand-faced brick with wide flush mortar joints add to the general effect, and the half-timber work does not have any appearance of having been touched by machine. The spacing of the timbers is in keeping with old traditions,—a most important point in the successful carrying out of this type of work. The master hands of designer and craftsman are apparent everywhere, both outside and in. It is real mortise and tenon construction, with good fat oak pegs in place of the more modern nail and hanger. A solid, substantial, thoroughly livable and modern house, made to last for many a year to come. Most of the walls of the rooms are framed up with solid chunks of oak, with rough plaster in between where there is no wood paneling, all in the old fashioned way, with numerous heavy beams and uprights moulded on the edges and stop-chamfered. The woodwork inside is in oak of a fine color and texture, with heavy oak doors studded with "W. I." nail heads. The doors have old fashioned wooden latches and bars. "The Tudors" gives one the feeling of living in a bygone age,—in the days when machinery was unknown, when people lived more simple lives, and probably got a good deal more out of life than they do now.

"Harbledown," near Canterbury, in Kent, is a charming example of a modern English country house with the walls built in a typical Kentish style. Intermixed with the local Kentish stone, brickwork is introduced in a skillful way, with a touch of half-timber work as is so often found in this part of England. The ground floor plan is typically English, while the dining room and kitchen arrangements are quite in keeping with American practice. The grouping together of the three main rooms with pergolas at either end gives an ideal arrangement from the point of view of entertaining. The bathroom accommodations, while not meeting with American demands, could easily be enlarged. Bedroom fireplaces add much to the attractiveness of a house of this type and give that feeling of coziness so often found lacking in the modern American residence. As has already been said, chimneys when well designed and skillfully arranged add very much to the appearance of any house, large or small.

Drawn freehand, the elevations of any house are interesting. Mr. Beresford, Baillie Scott's partner, prepared the drawings of their house and garden at Chilham. The elevations are delightfully drawn and give much character to the house. The west elevation is a perfectly charming example of a real country home. The cottages and small houses of Baillie Scott have the same atmosphere and feeling as his larger buildings, and the perspective sketches shown in these pages give the reader a good idea of what he has done to make the small house attractive.

If personal environment and the associations of older times can add anything to the abilities of a designer, surely some of the architects' offices in London ought to help greatly in this respect. Lincoln's Inn and Grey's Inn are about as far removed from the modern new Regent Street as are the older villages and towns of New England from the modern atmosphere of Fifth Avenue. In the former case we are taken back into the days of the stage coach, full of much that was picturesque in more ways than one. It was in Grey's Inn Square that I found Baillie Scott's office, amid surroundings it would be impossible to find in any modern and so-called, up-to-date town,—and some of the modern towns are painfully up to date. Looking out on an old square, with fine lawns and great trees, it seemed an ideal situation in which an artist might work, giving one almost the feeling of working in the country. It seems strange these days to think of men having labored for generations in these old and often historic places, where one would naturally suppose that the atmosphere must affect those who work there now. Some day all these buildings will probably be removed, and in their places we shall have more modern structures, lacking much of the charm of the old in the same way in which the new edition of Regent Street fails utterly to inspire one in the way the former buildings did. On the walls of Baillie Scott's own room are fascinating drawings in color, sketches which one thinks must have "sold" the prospective client again and again. Perspective drawings and small scale elevations, in color, pencil and ink, give one a good idea what can be done in the hands of artists like Baillie Scott and his partner.

It has been possible to illustrate here only a small selection from the large amount of work done by Baillie Scott,—houses built not only in England but in different parts of the world. A facile and original brain has given many charming and imaginative touches to all of Baillie Scott's houses, to be handed down to future generations and treasured by them,—buildings representing the best of present-day work.

THE COMPETITION FOR THE NEW HAVEN CITY HALL

ONE of the most interesting competitions of the past year was that for the New Haven City Hall. Everett V. Meeks, head of the Architectural Department of the Yale School of Fine Arts, who was appointed by the Mayor of New Haven to act as architectural adviser, made all of the arrangements for the competition. In order to give the architects in New Haven an opportunity to compete for this large municipal building and civic auditorium, Mr. Meeks decided to hold preliminary and final competitions. The first competition was open only to architects practicing in New Haven. From this preliminary competition three architects were chosen to be admitted to the final competition, which also included three other well known architectural firms, making six competitors in all. The three New Haven architects selected were Douglas Orr, Harrison Earl Baldwin, and Walter Shiner. With Harrison Earl Baldwin, Paul Philippe Cret, of Philadelphia was associated; and with Walter Shiner, Dennison & Hirons, of New York, were affiliated. The three outside architects invited to compete in the final competition were Egerton Swartwout, Delano & Aldrich, and Zantzinger, Borie & Medary, of Philadelphia. The architects invited by Mr. Meeks to act as the judges of this competition, were Harvey Wiley Corbett and Charles A. Platt, of New York, and William Emerson, Dean of the Architectural School of the Massachusetts Institute of Technology.

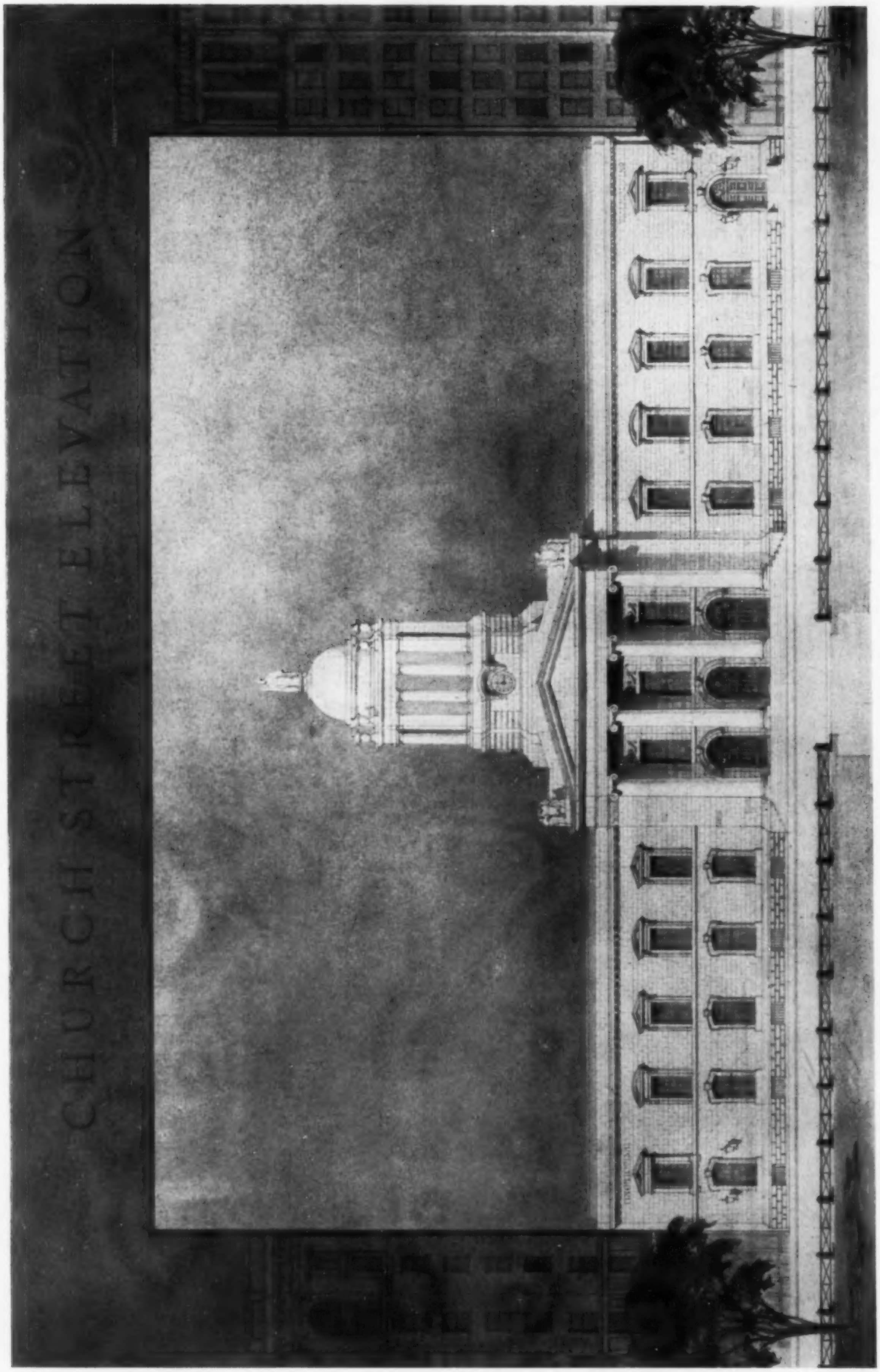
This digest of the program, and the final reports of the findings of the judges in the preliminary and final competitions, give an excellent idea of the character and result of this interesting competition. The plot is of irregular shape and level grade. The main frontage, 229 feet long, is on Church Street facing the New Haven Green, which is well covered with large elms. Some 300 feet south, on the same street, and also facing the Green, is the new post office of Tennessee marble with a large 10-column portico. Facing the site and the post office there are two fine old Colonial brick churches on the Green, each with a good sized wooden portico. Facing the Green, to the north are the New Haven Library and the County Court House. The scheme is divided into three units; the first a departmental building on Orange Street, to be built before the other units, containing 600,000 cubic feet. The third is an auditorium on Court Street, with a cubage of 666,666 feet and a seating capacity of 3000. Vehicular access, in addition to that in Court Street was desired. The second, the final complete building, minus units one and three, has a cubage of 1,536,842 feet. This unit contains the aldermanic chamber and two anterooms; the mayor's offices; two city court rooms, civil and criminal; judges' chambers and consultation rooms for each, with prisoners' pen on the criminal side with connection by stairs with the police lockup; probate court and dependencies; city attorney, clerk of courts, jury room, stenographers' room, etc., the court room dependencies to be so located that direct access to the court rooms can be had without crossing public thoroughfares; quarters, 26,750 square feet, for the police department, with access by driveway to the street; space for the health department, 19,000 square feet, on or near the ground floor, with separate entrance facilities; three hearing rooms and anterooms, 7,500 square feet each; rooms for the board of education, fire department, etc.

Drawings required:

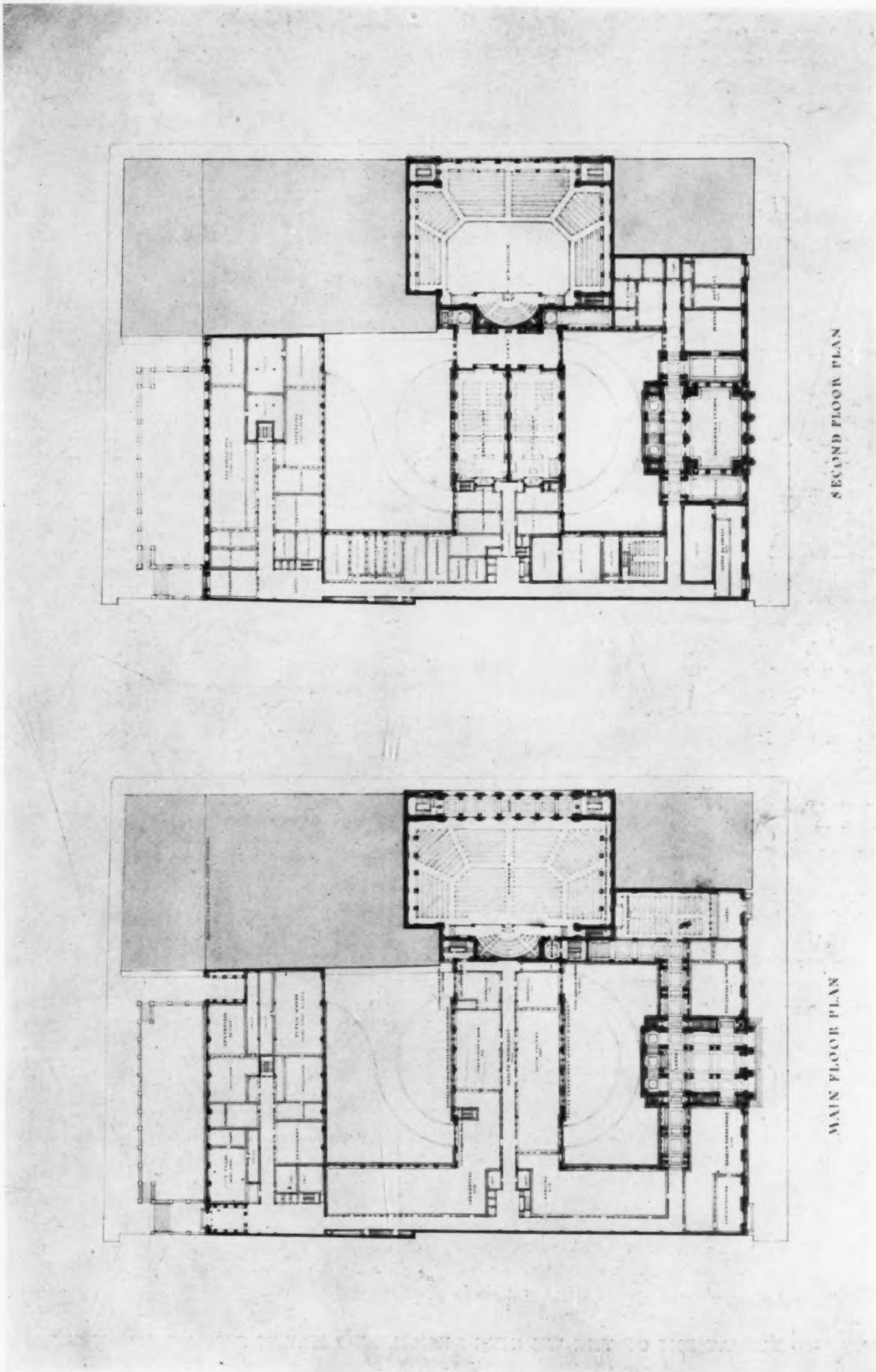
- Three elevations at 1/16 scale.
- Two plans, main and second floor, of entire scheme at 1/32.
- Complete plans of first unit at 1/16.
- Two sections at 1/16.

First Report of Competition. "The Architectural Jury of Selection for the Competition of the Proposed City Hall for New Haven met on April 19, 1928, and made first a thorough examination of the site, studying the relation of the plot to the Green and to the adjacent streets. The Jury then began a careful study and comparison of the designs submitted, starting by assembling all the general plans, analyzing each with reference to such considerations as light and circulation, distribution of departments, etc. As a result of this study a preliminary rating was determined. Then the facades and typical floor plan and section of each competitor were brought back and compared with his general plan layout. All the plans showed a high grade of excellence in scheme and presentation, but there were features in each which afforded a decided basis of comparison; and a final rating, after exhaustive study from all angles, was unanimously agreed upon by the Jury. From this rating, the Jury selected the makers of three designs in the order rated, as those competitors to be chosen to enter the second and final stage of the competition."

Final Report of Competition. "As a result of study, one plan seemed to comply more fully than the others with all the essential factors of the problem and was given a preliminary rating, but before final decision the facades and typical floor plan and section of each competitor were brought back and compared with his general plan layout. After continued study of all the plans, it was finally decided unanimously that the Jury recommend to the New Haven City Hall Building Commission that the design marked No. 1, which was submitted by Egerton Swartwout of New York, be the premiated design." The efficient and eminently satisfactory manner in which this competition was handled by Mr. Meeks, of the Yale Architectural School, emphasizes anew the advisability of placing charge of any important competition in the hands of an experienced architect who shall act as architectural adviser.



WINNING DESIGN IN THE NEW HAVEN CITY HALL COMPETITION
EGERTON SWARTWOUT, ARCHITECT

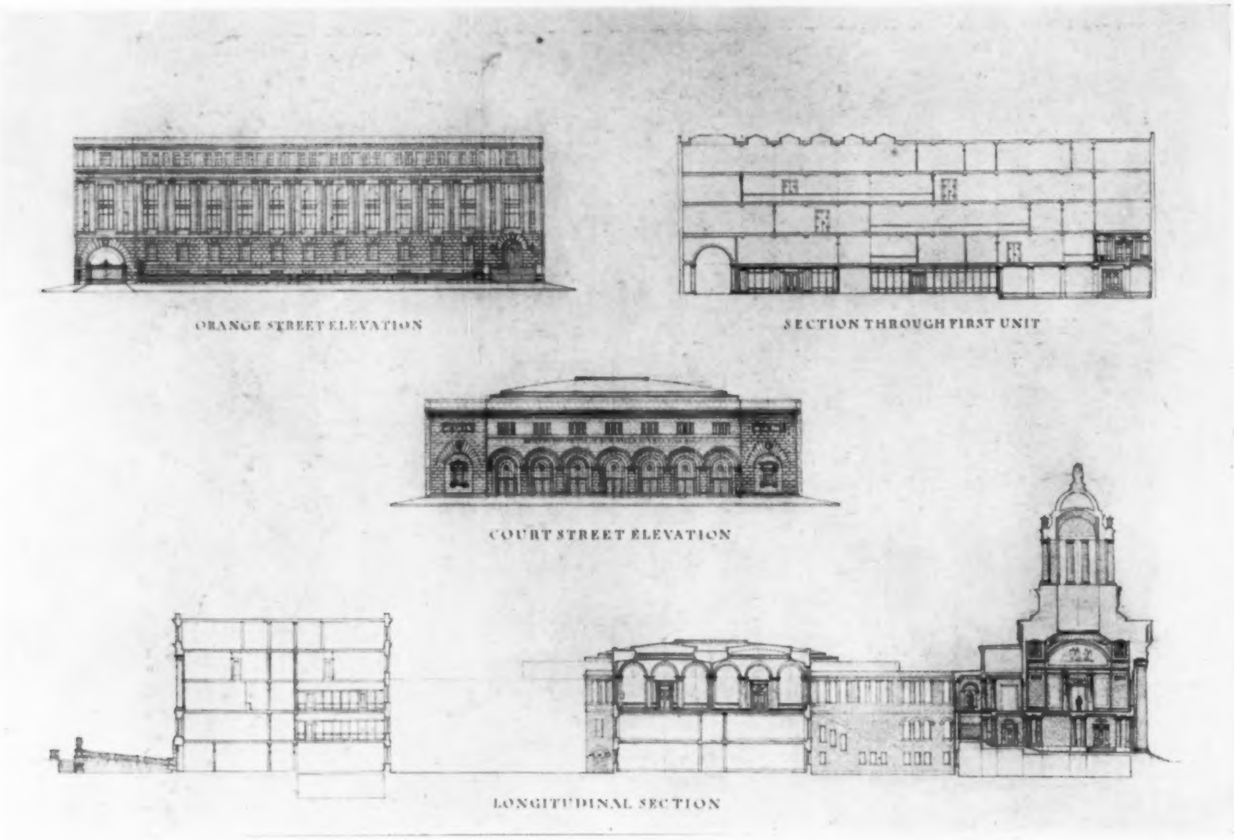


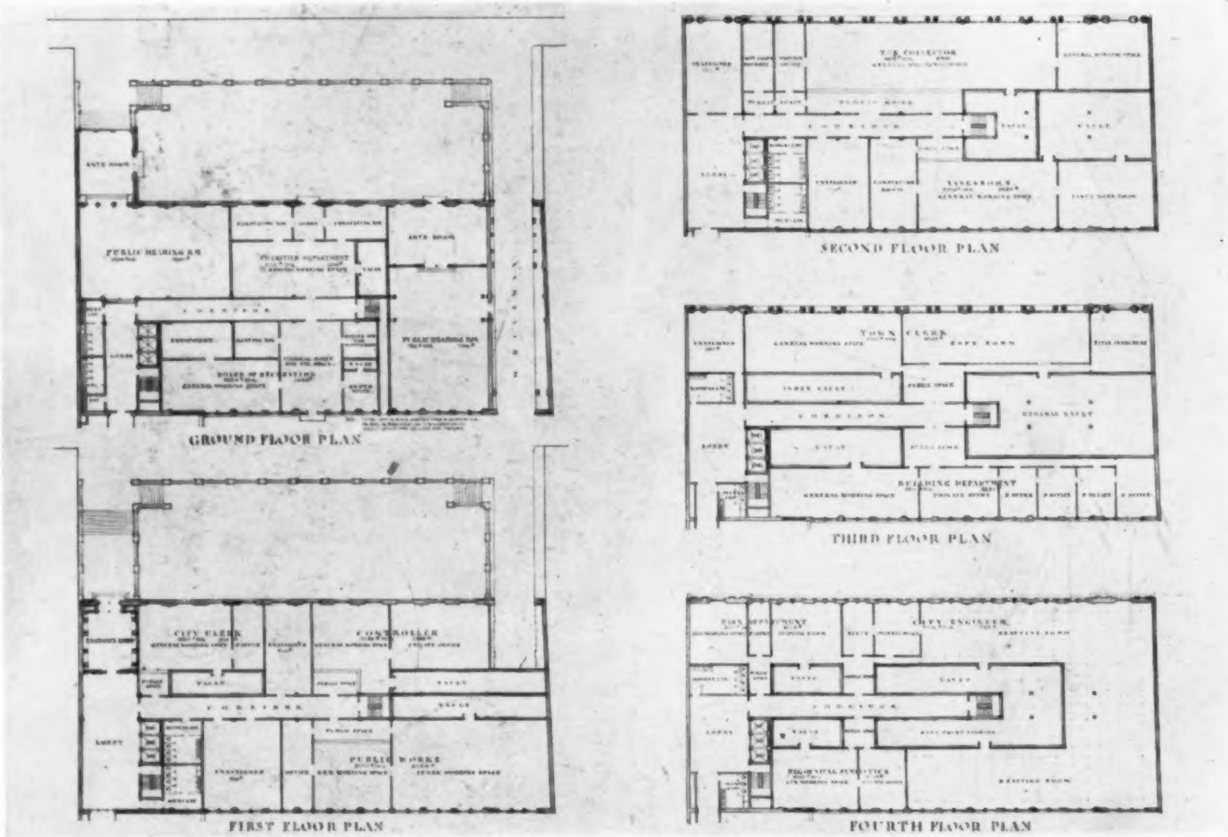
SECOND FLOOR PLAN

MAIN FLOOR PLAN

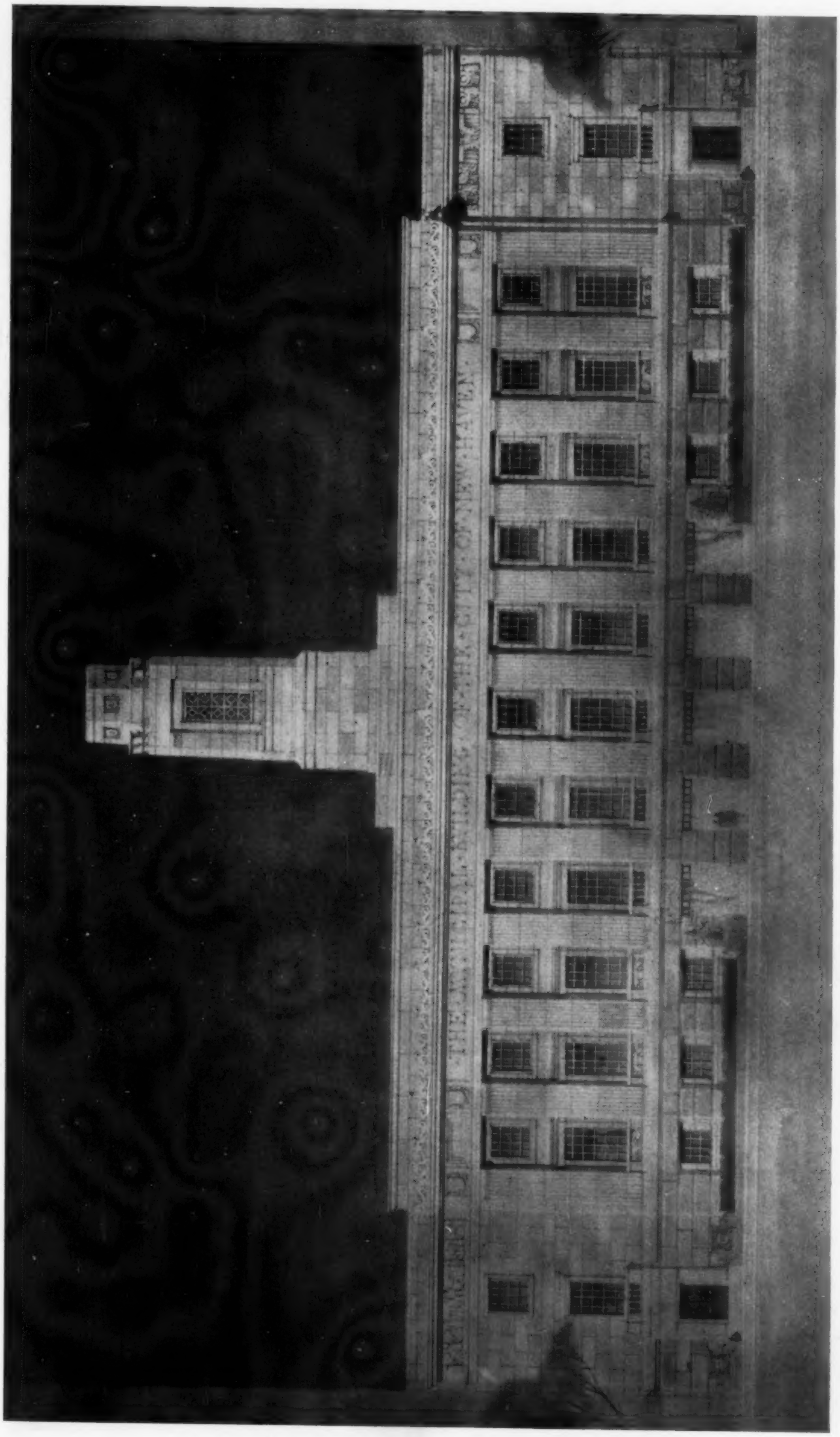
THE WINNING DESIGN IN THE NEW HAVEN CITY HALL COMPETITION

EGERTON SWARTWOUT, ARCHITECT

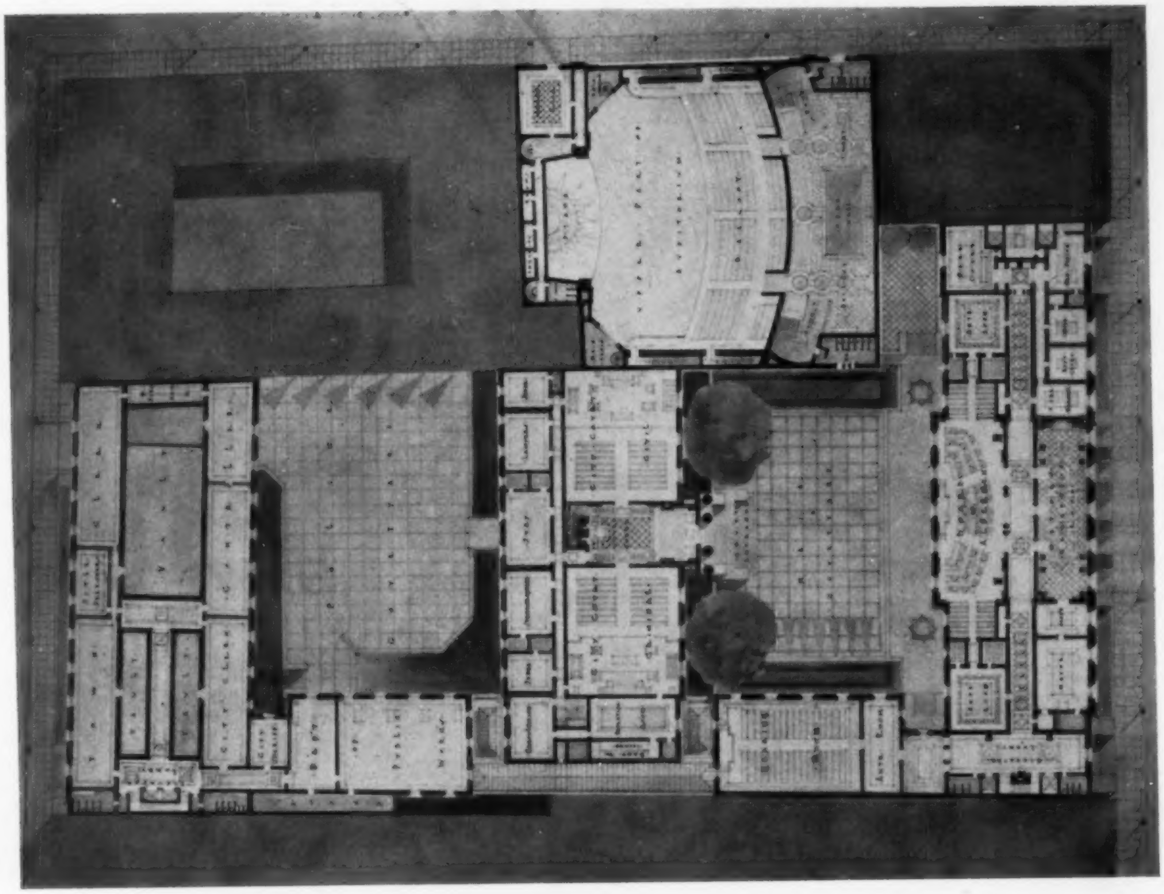




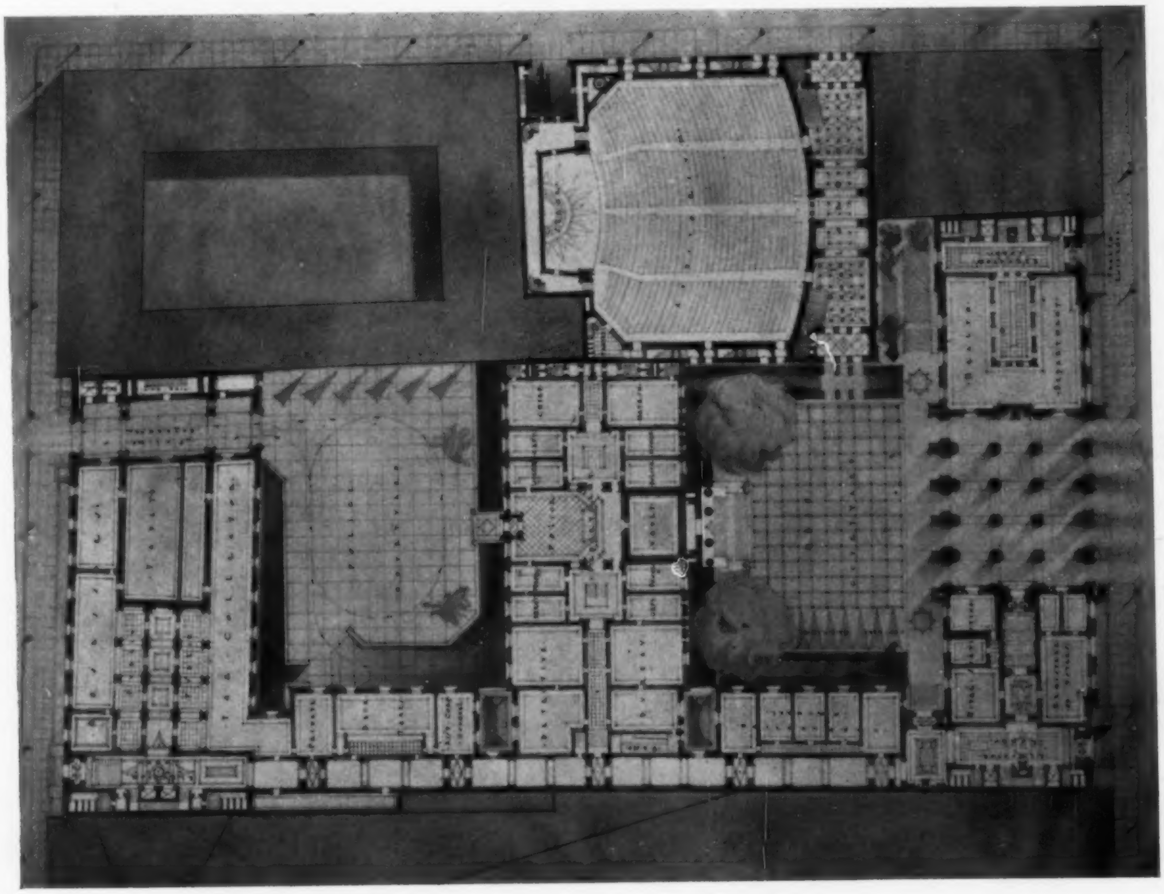
PLANS AND ELEVATIONS OF THE WINNING DESIGN, NEW HAVEN CITY HALL COMPETITION



CHURCH STREET ELEVATION, NEW HAVEN CITY HALL COMPETITION
DOUGLAS ORR, ARCHITECT



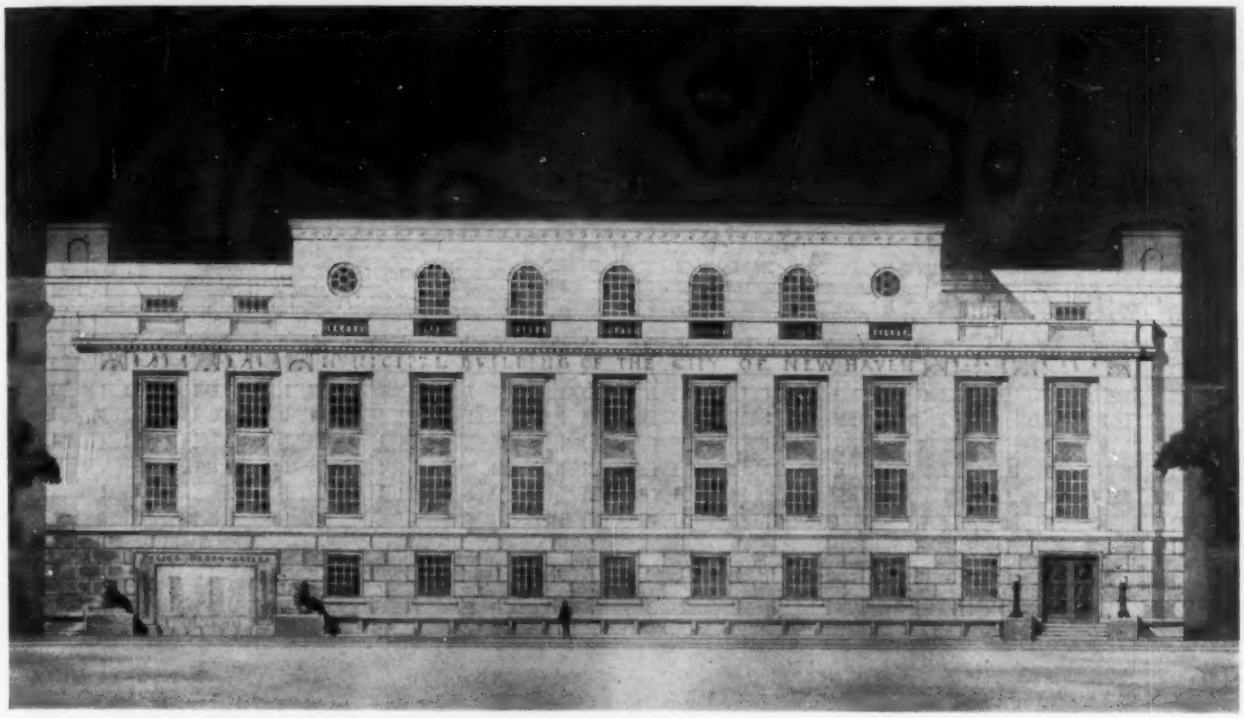
SECOND FLOOR



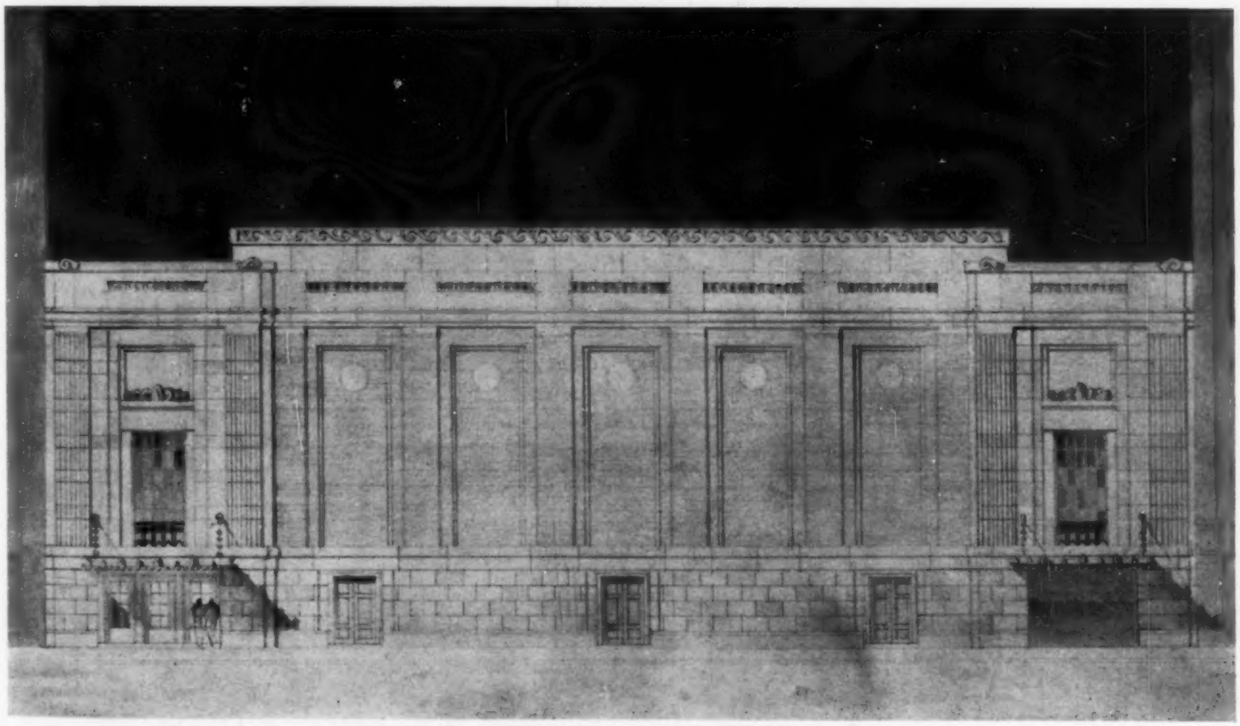
FIRST FLOOR

NEW HAVEN CITY HALL COMPETITION

DOUGLAS ORR, ARCHITECT

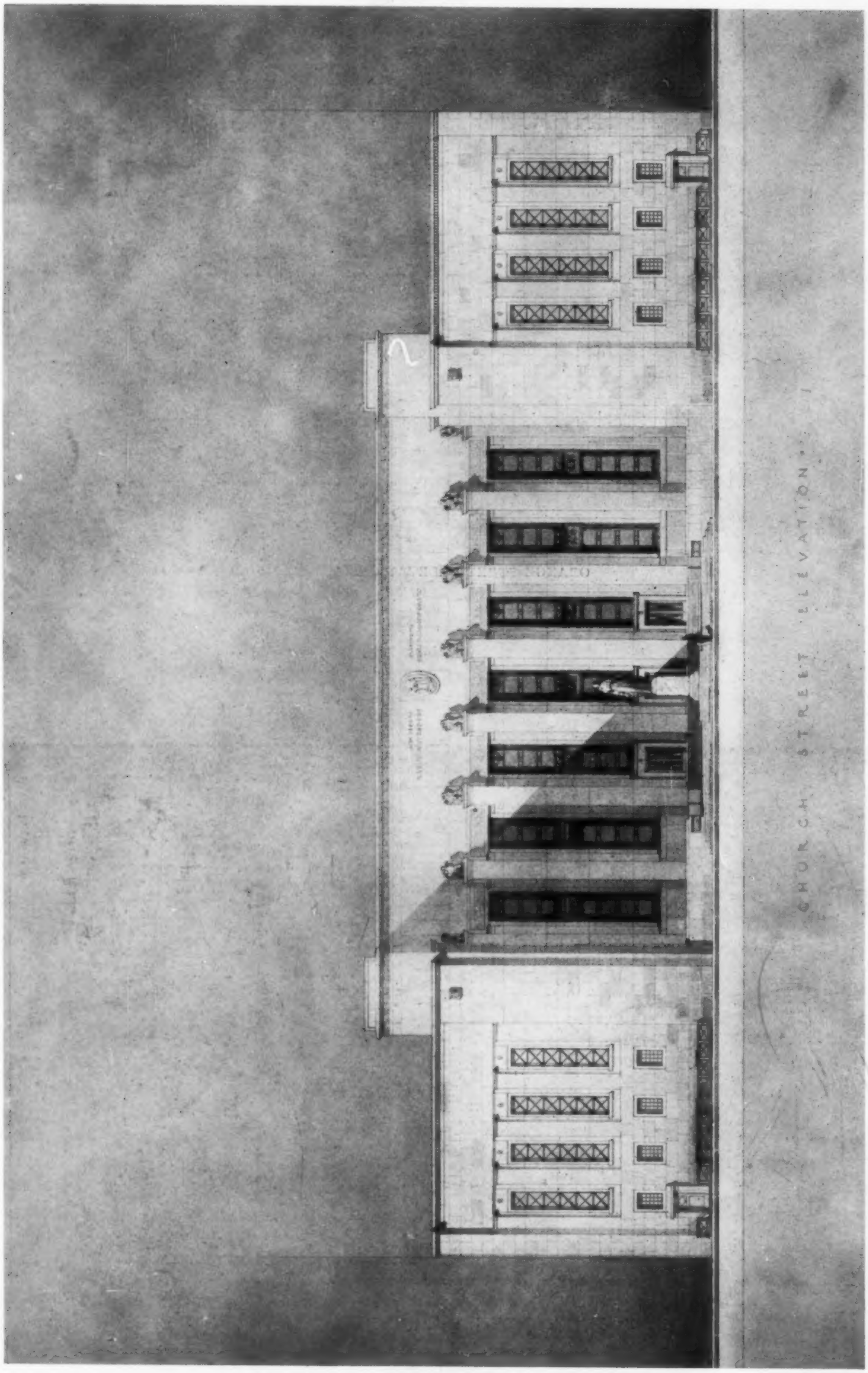


ORANGE STREET ELEVATION

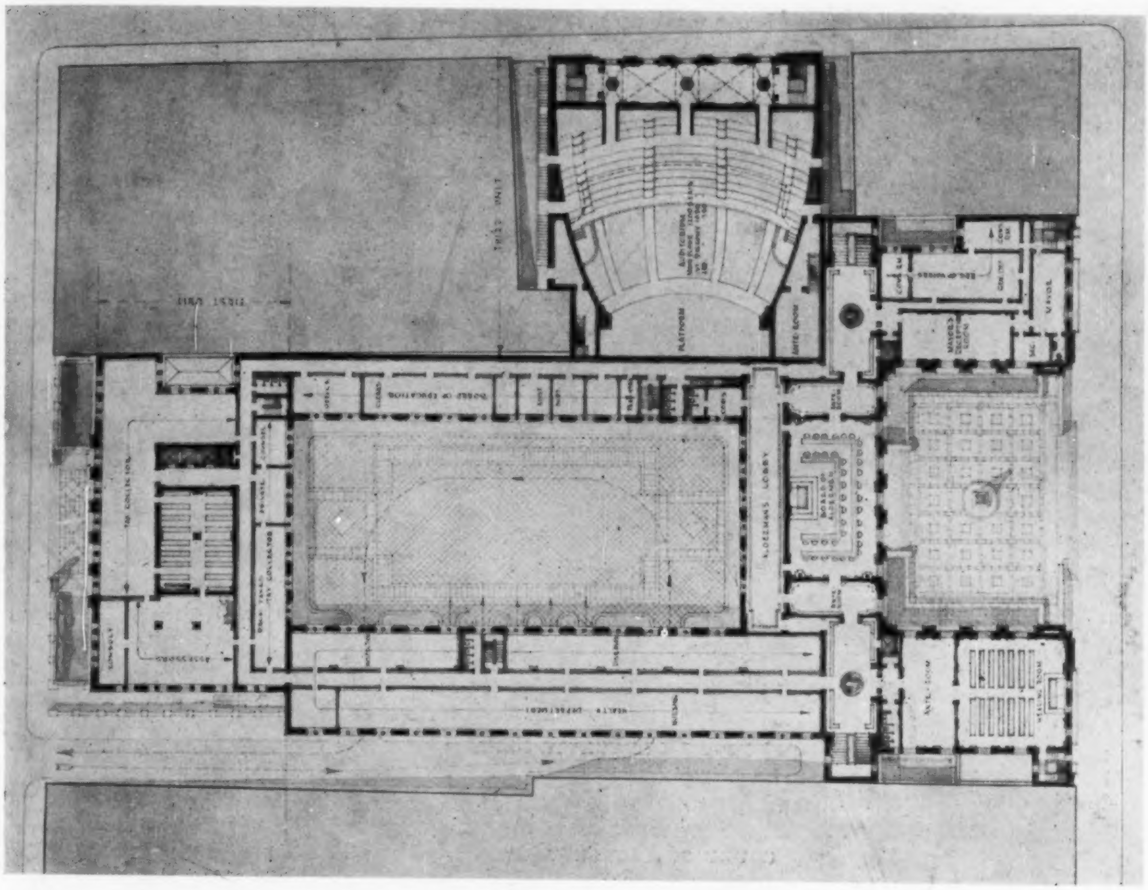


NEW HAVEN CITY HALL COMPETITION

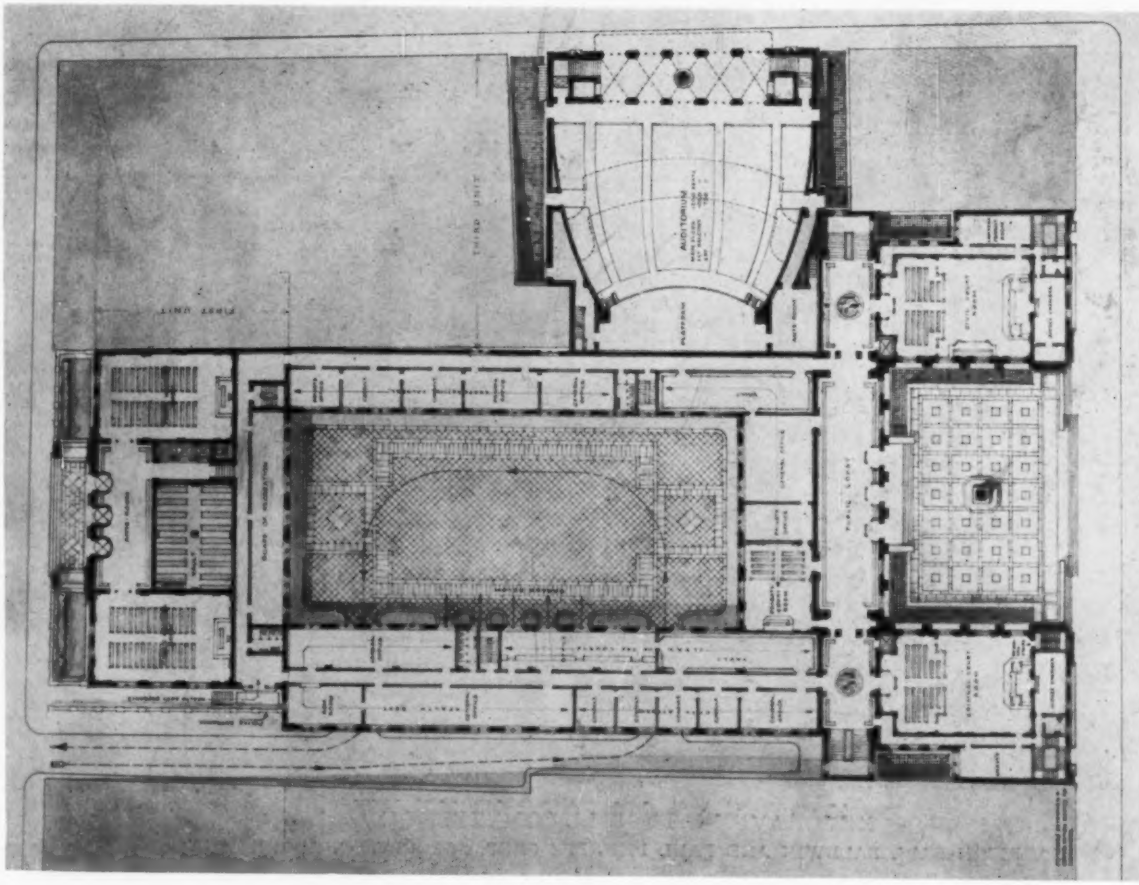
DOUGLAS ORR, ARCHITECT



CHURCH STREET ELEVATION, NEW HAVEN CITY HALL COMPETITION
HARRISON EARL BALDWIN AND PAUL PHILIPPE CRET, ASSOCIATED, ARCHITECTS



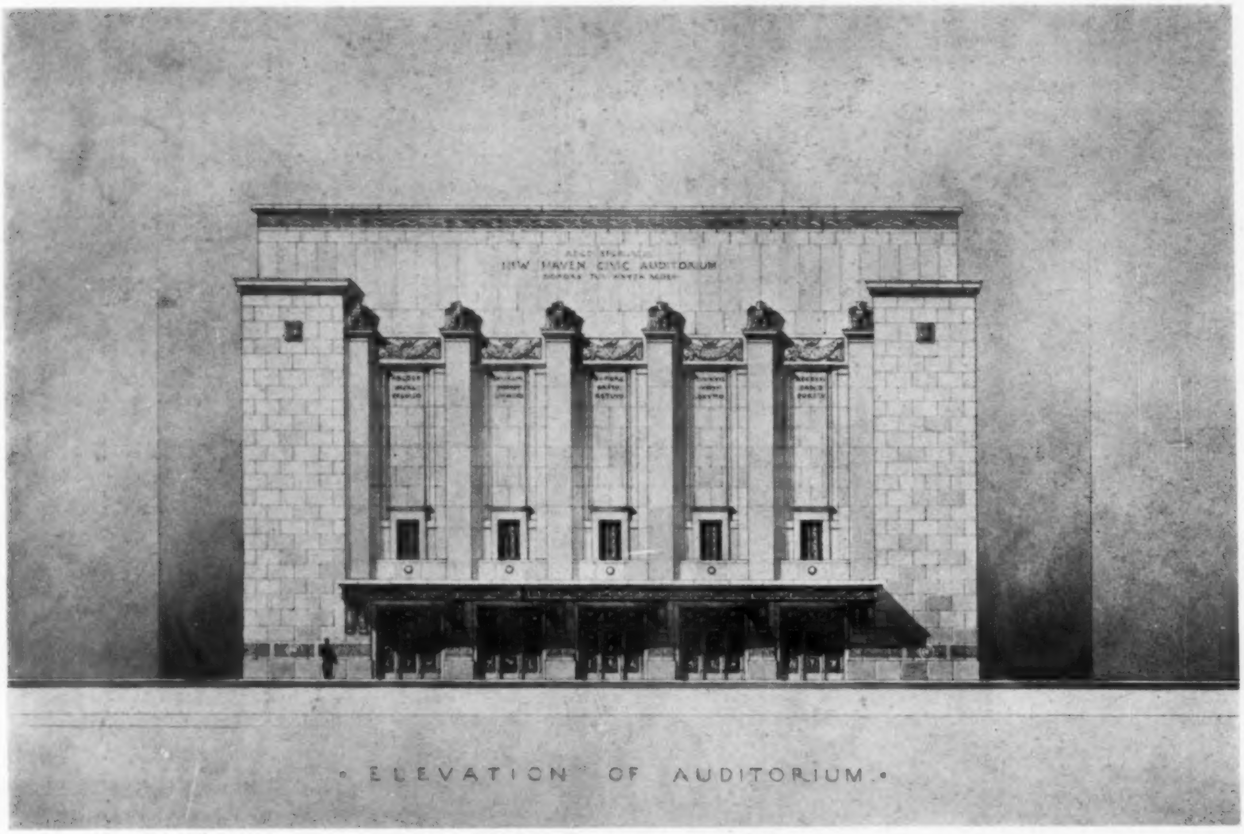
SECOND FLOOR



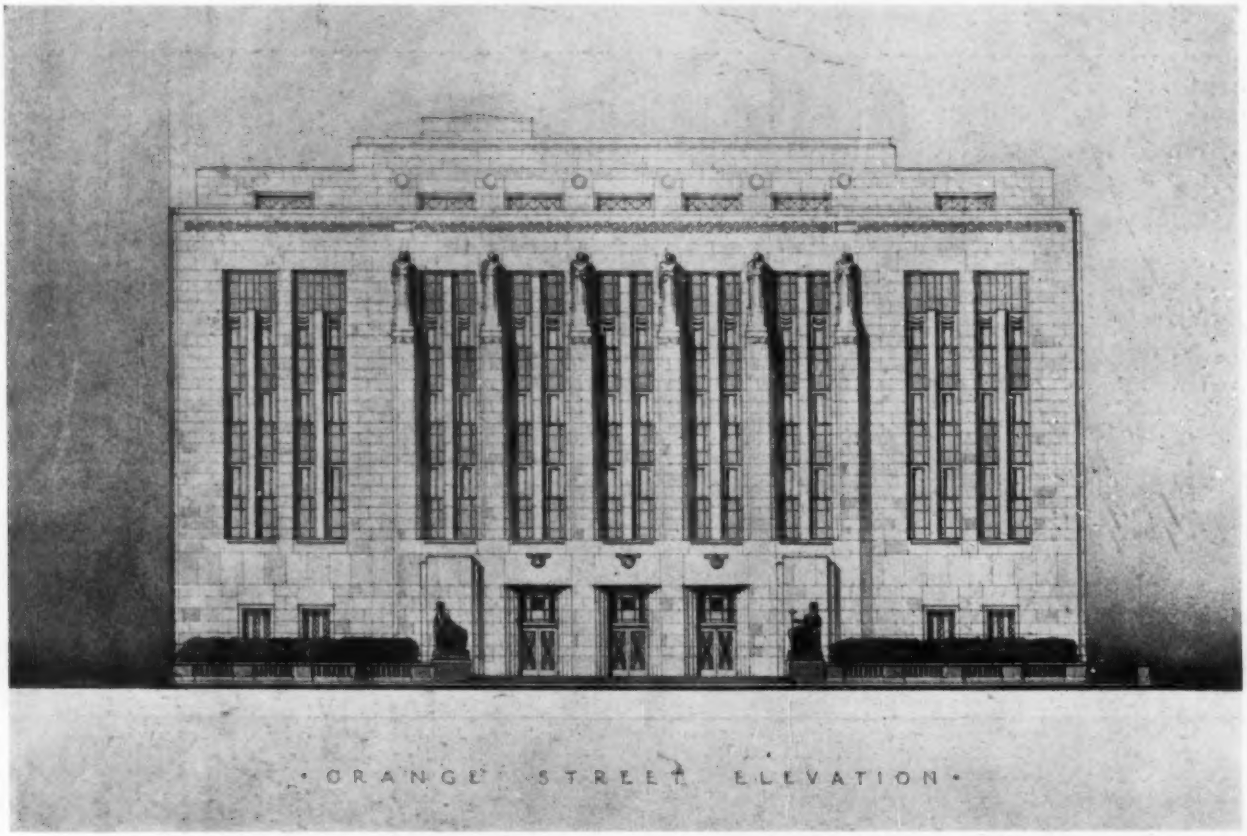
FIRST FLOOR

NEW HAVEN CITY HALL COMPETITION

HARRISON EARL BALDWIN AND PAUL PHILIPPE CRET, ASSOCIATED, ARCHITECTS

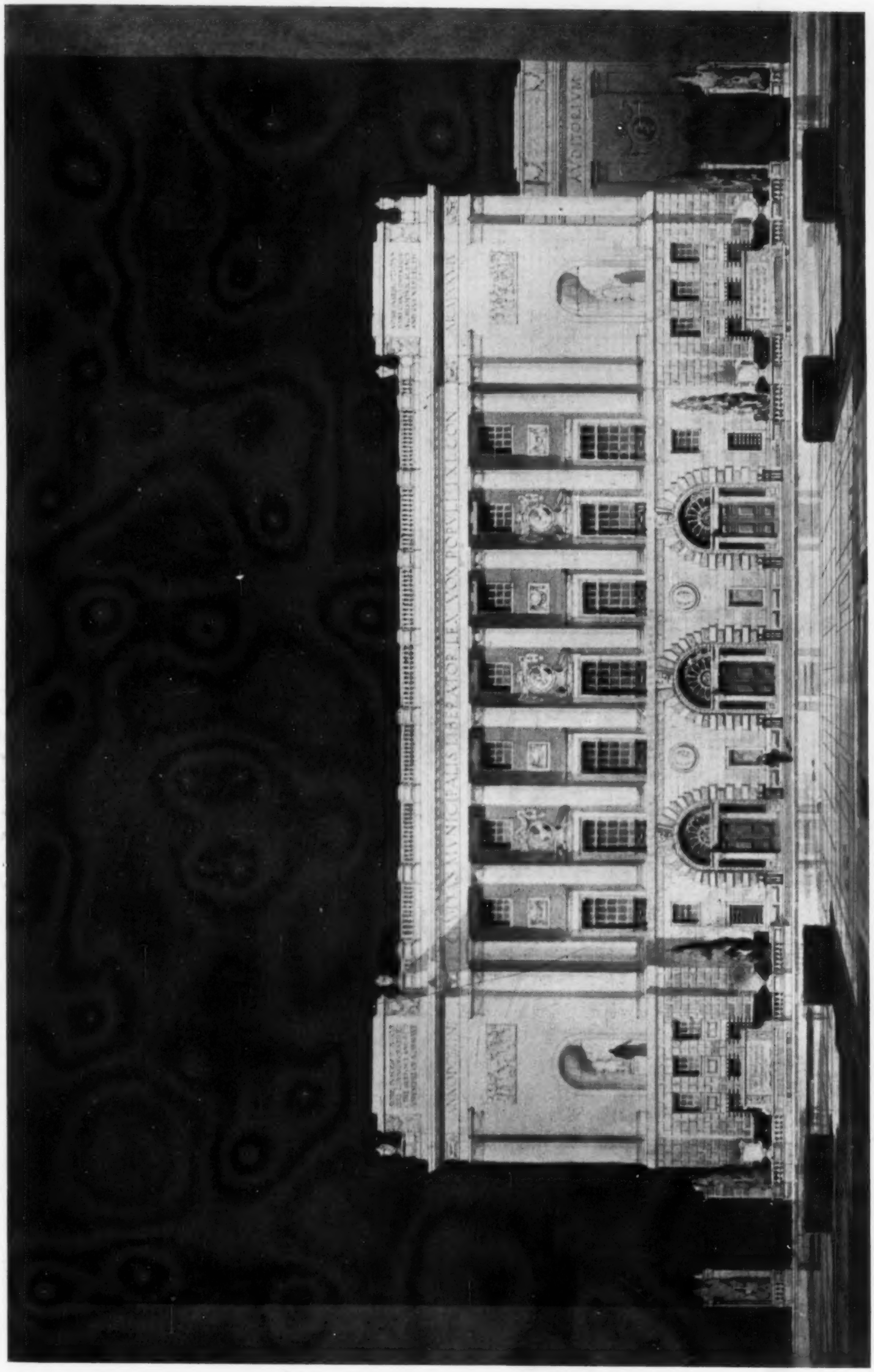


COURT STREET ELEVATION

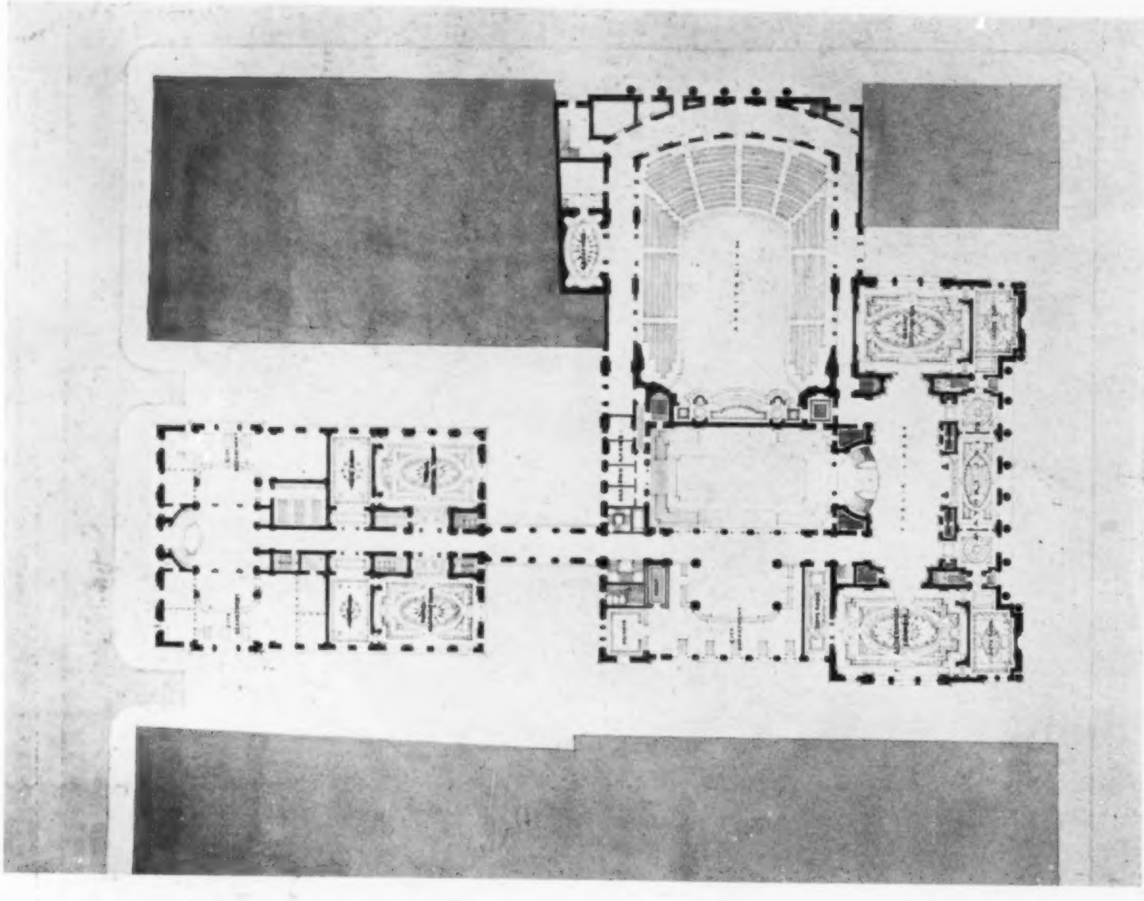


NEW HAVEN CITY HALL COMPETITION

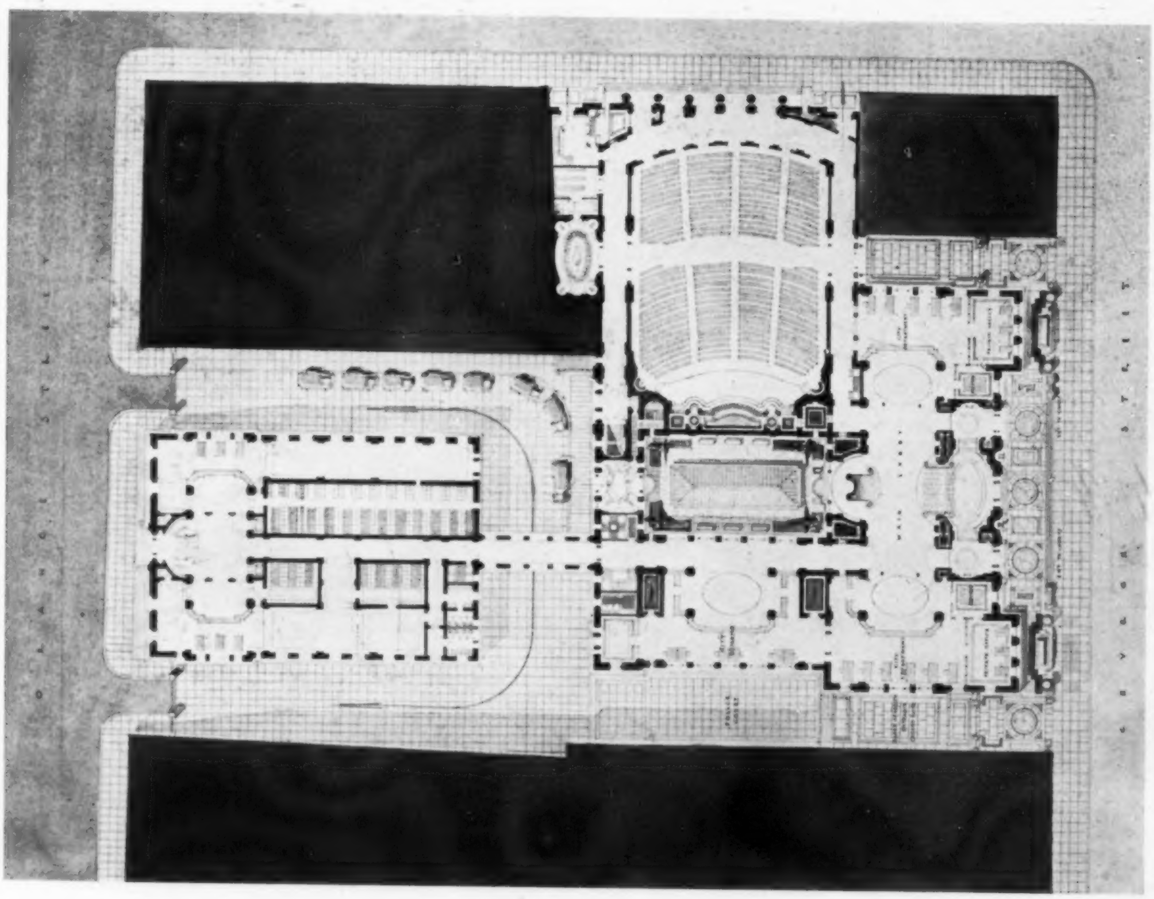
HARRISON EARL BALDWIN AND PAUL PHILIPPE CRET, ASSOCIATED, ARCHITECTS



CHURCH STREET ELEVATION, NEW HAVEN CITY HALL COMPETITION
WALTER SHINER AND DENNISON & HIRONS, ASSOCIATED, ARCHITECTS



SECOND FLOOR

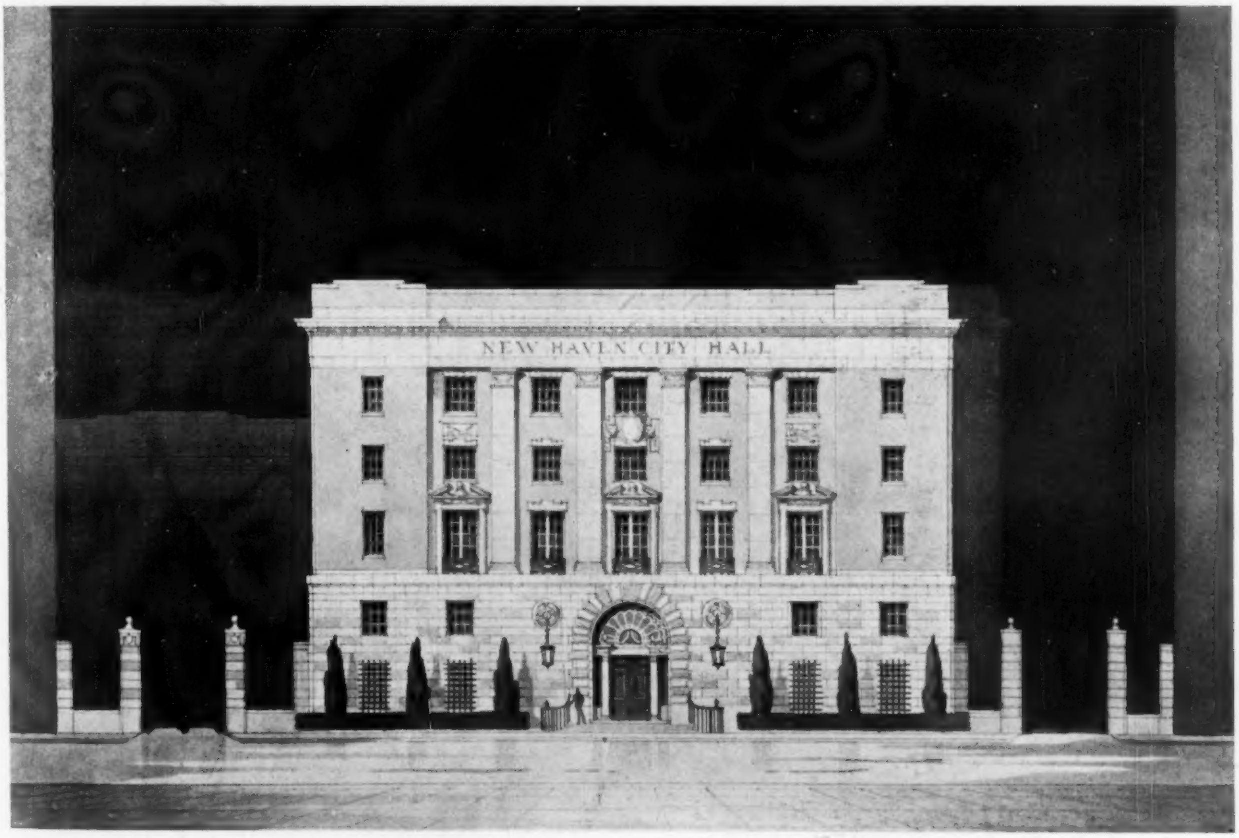


MAIN FLOOR

NEW HAVEN CITY HALL COMPETITION

WALTER SHINER AND DENNISON & HIRONS, ASSOCIATED, ARCHITECTS

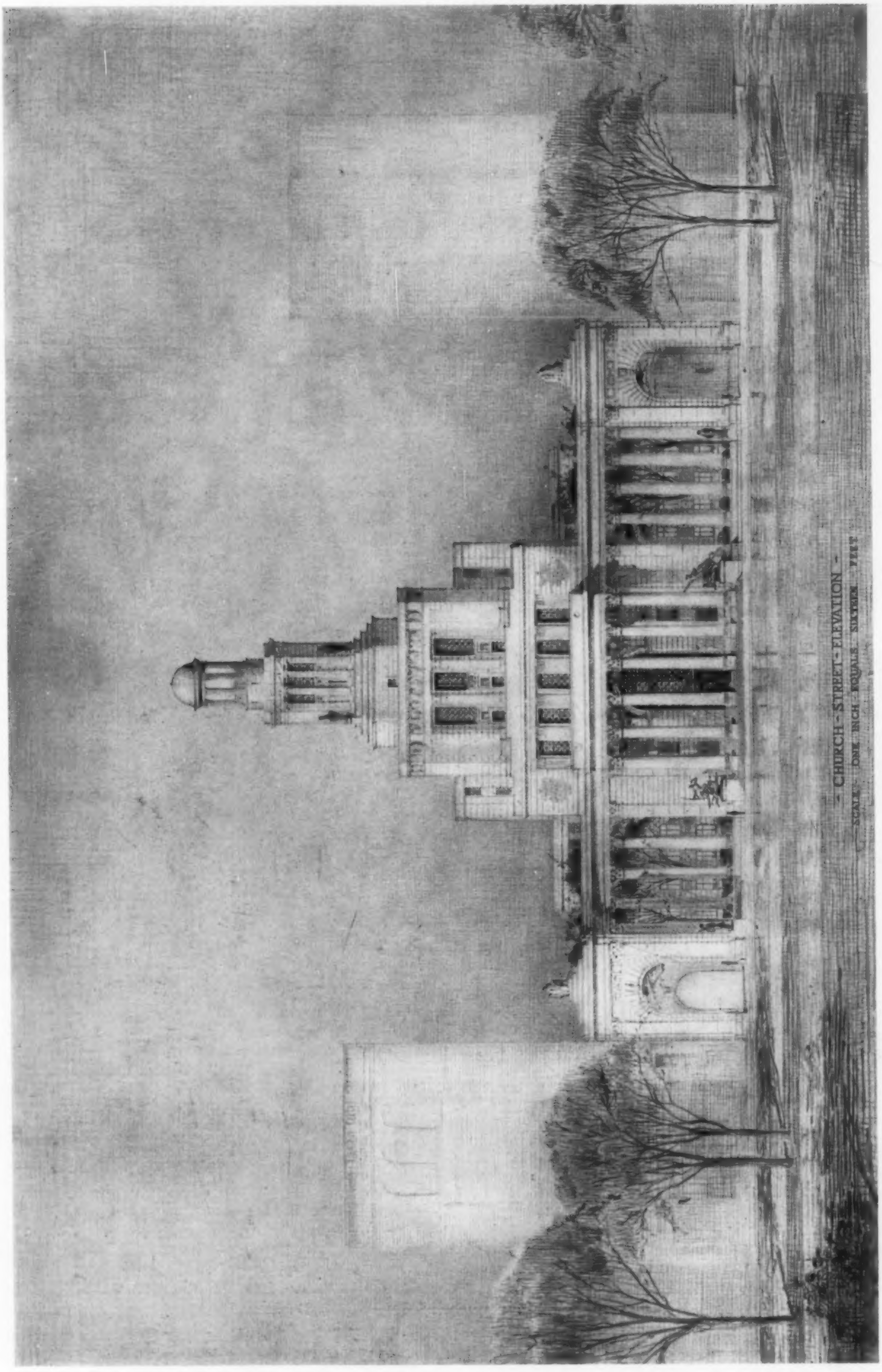
ELEVATION OF AUDITORIUM, ON COURT STREET



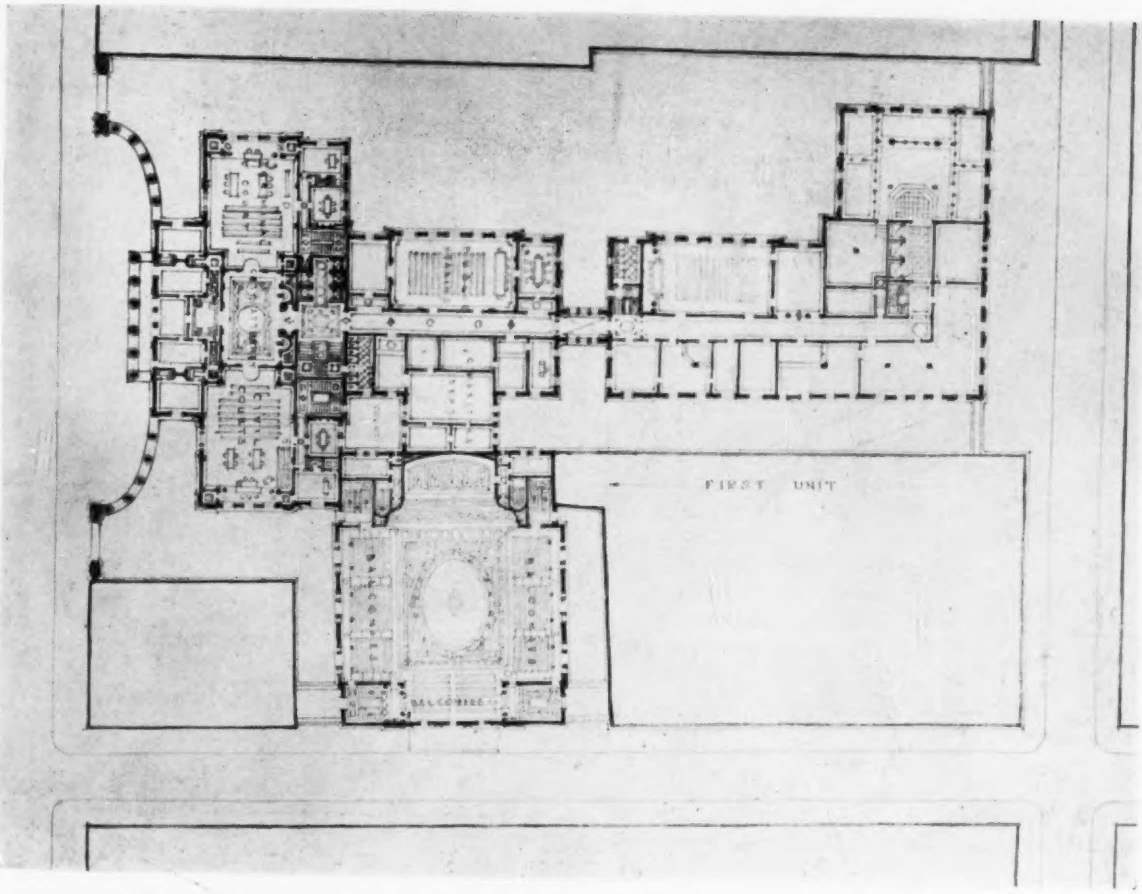
ELEVATION OF FIRST UNIT, ON ORANGE STREET

NEW HAVEN CITY HALL COMPETITION

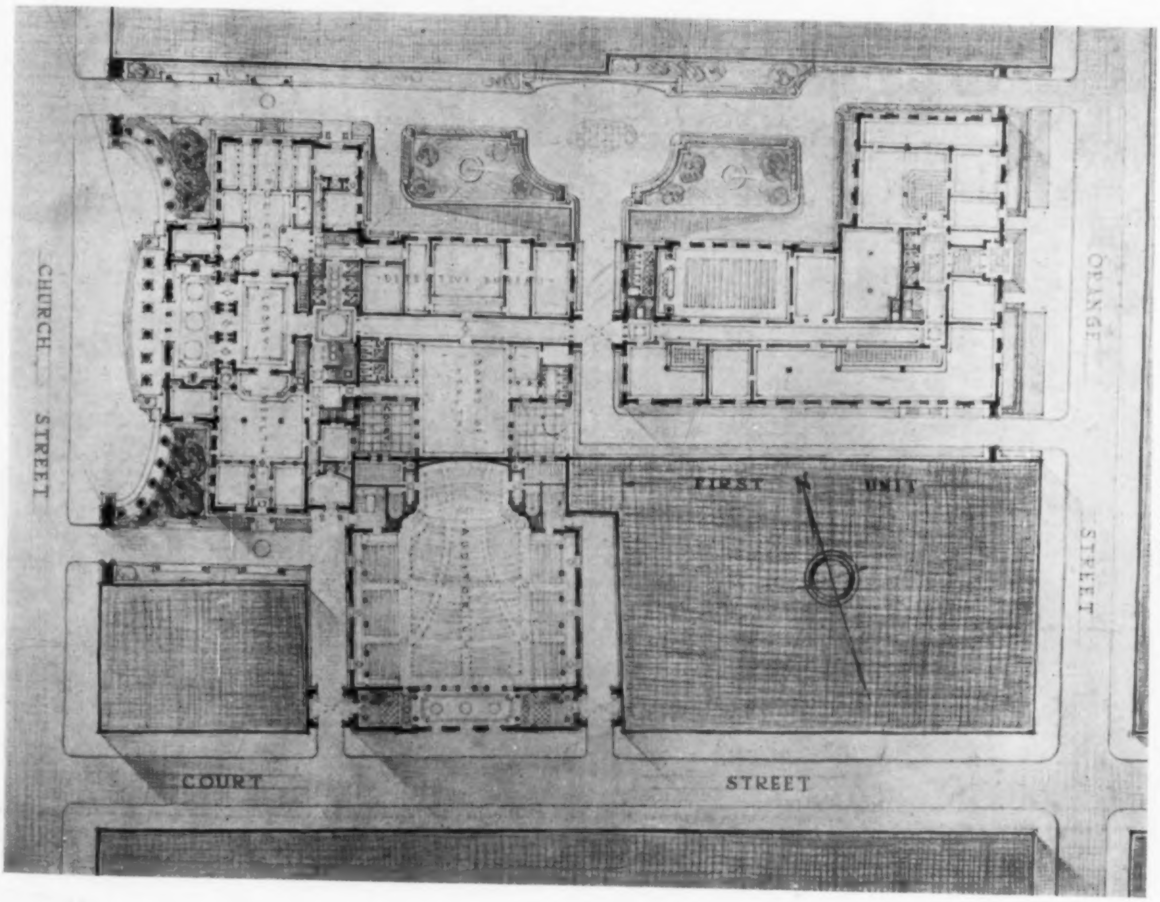
WALTER SHINER AND DENNISON & HIRONS, ASSOCIATED, ARCHITECTS



NEW HAVEN CITY HALL COMPETITION
ZANTZINGER, BORIE & MEDARY, ARCHITECTS

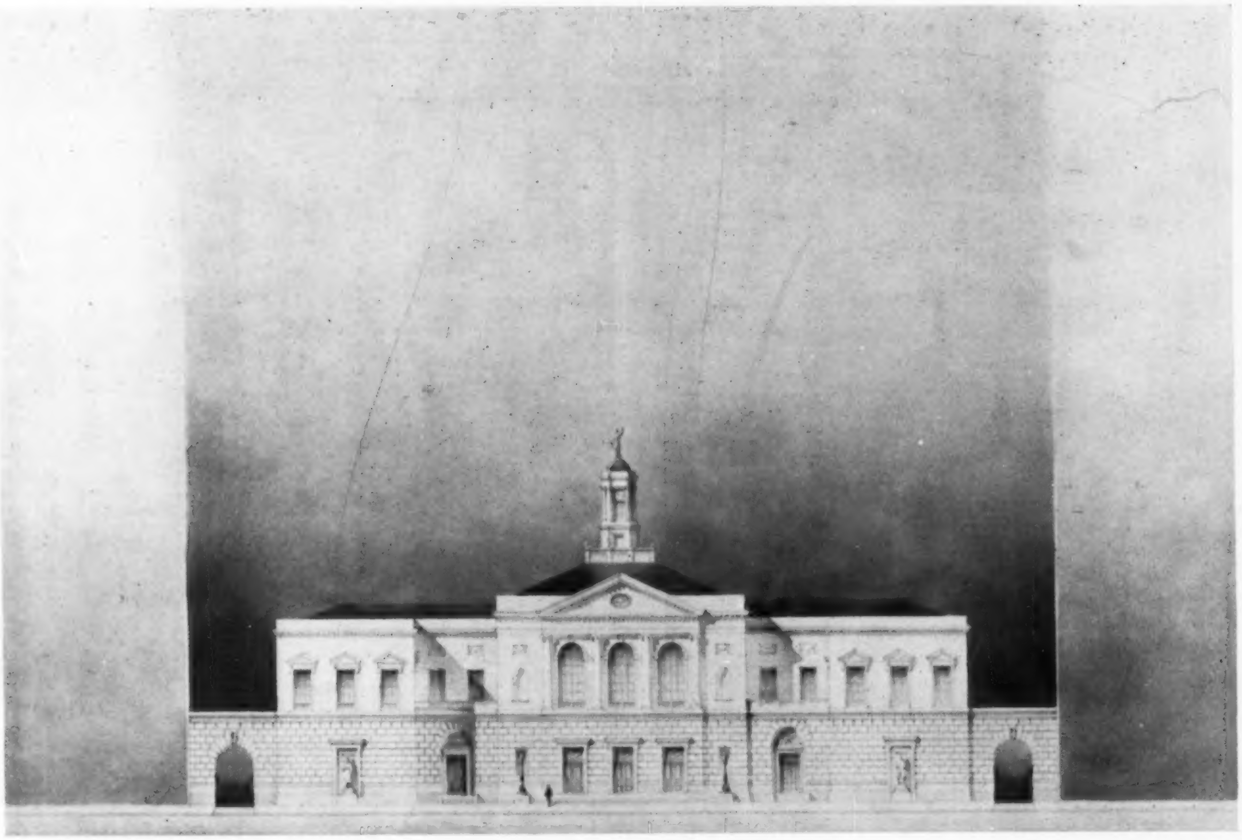


SECOND FLOOR

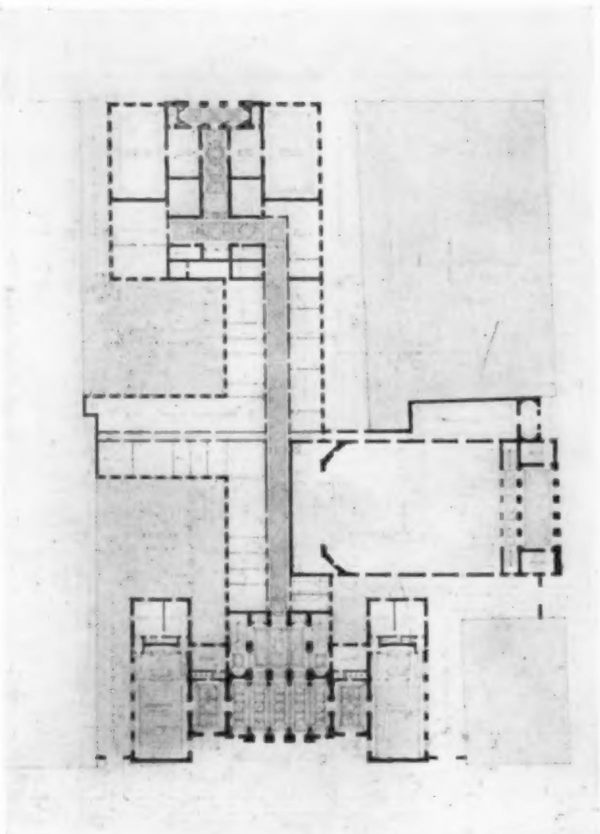


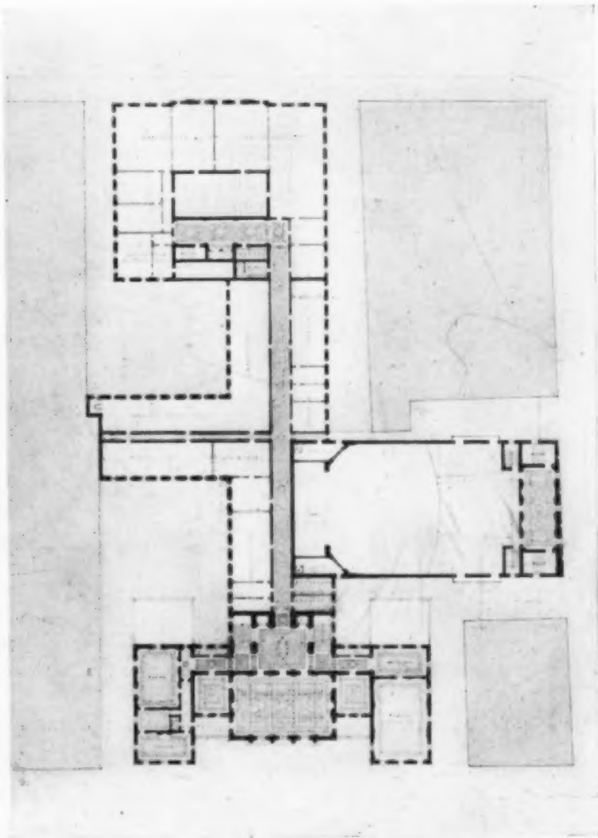
FIRST FLOOR

NEW HAVEN CITY HALL COMPETITION
ZANTZINGER, BORIE & MEDARY, ARCHITECTS



CHURCH STREET ELEVATION





FIRST FLOOR SECOND FLOOR

NEW HAVEN CITY HALL COMPETITION

DELANO & ALDRICH, ARCHITECTS

A REGENCY HOUSE AT FARNHURST-BY-NEW CASTLE, DELAWARE

TEXT BY HAROLD D. EBERLEIN
MEASURED DRAWINGS BY W. POPE BARNEY

THE little Regency house at Farnhurst-by-New Castle, in Delaware, shown in the accompanying half-tone illustrations and plates of measured drawings, is one of those documents of American architectural history that deserve to be cherished and preserved with the utmost care and studied with close attention. It was built between 1815 and 1820, and is as perfect an expression of small domestic architecture in the Regency manner as anything to be found in America. Indeed, it would be difficult to find in England any better small example of this phase of design, which reached its ripest development during the first quarter of the nineteenth century. For subtle elegance of composition, delicacy of detail and reticent simplicity it can compare favorably with any of its like-sized peers, on either side of the Atlantic, cast in the mould of that tradition begun by Henry Holland and carried on by Nash and Papworth, Cockerell and Mylne, in England, and by Latrobe, Robert Mills and Graff, in America.

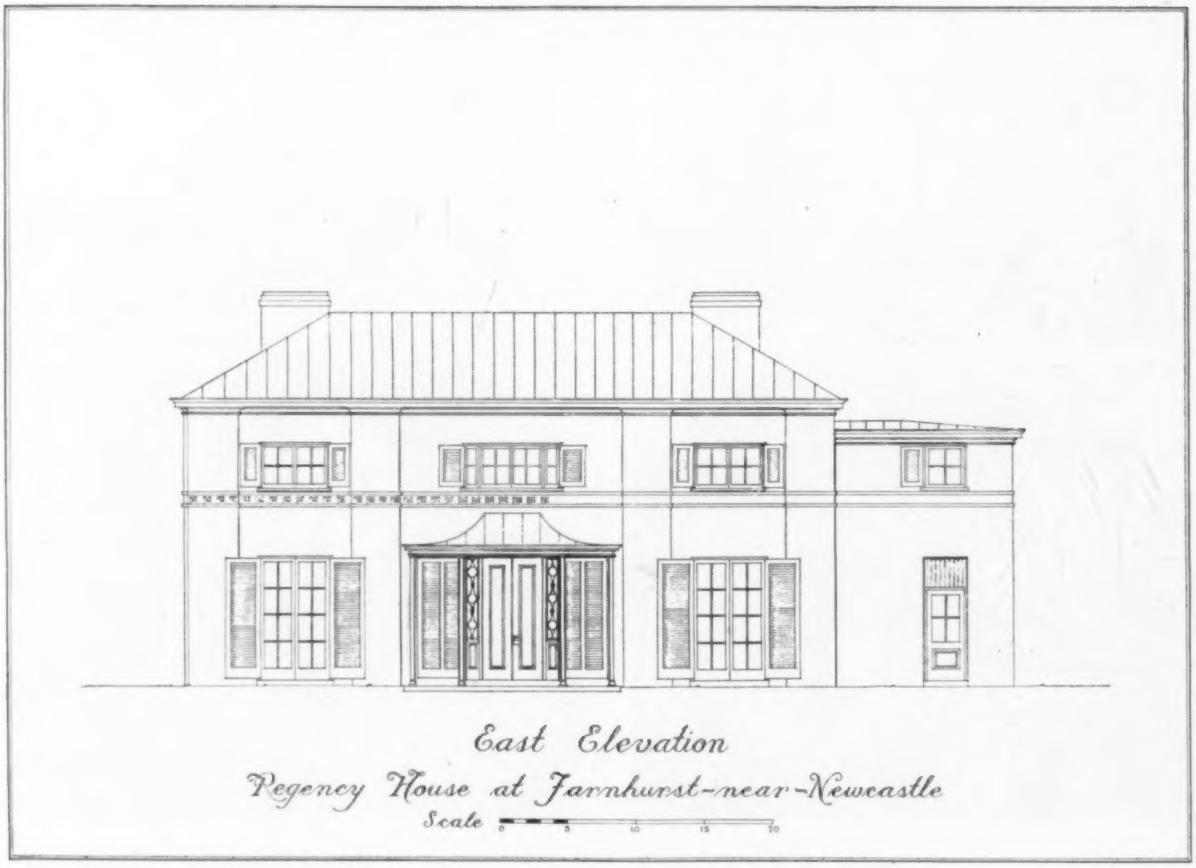
This small but once perfectly appointed "gentleman's seat," near the banks of the Delaware River, has now fallen into a sorry state of decay, not so far advanced, however, that it could not be arrested and the fabric restored to sound condition without serious difficulty. Much as this decay is to be deplored, it has nevertheless made it possible to examine the structure, so to speak, in certain particulars far more readily and with far more certitude of results than could have been expected had the building been in perfect repair. To illustrate, unless the thin wood ceiling of the little semi-elliptical portico of the west front had been rotten and partly gone, it would have been hard to determine what was the exact original contour of its roof,—whether it was a true half-saucer dome, as it should have been according to the best usage of the period, or whether its now somewhat lumpish contour was merely the result of repeated and clumsy patchings with odd pieces of tin,—which seemed by no means impossible. Taking advantage of the holes in the decayed wood ceiling, however, with the precarious aid of a rickety ladder that threatened to collapse every minute, and by thrusting arms and heads through the holes in the boarding, the exact contour of the original oak forms could be determined. The roof was unquestionably a half-saucer dome, with a slight outward flare at the eaves. Again, the uncared-for condition of the exterior made possible the settling beyond all peradventure of several questions about the belt course and the joinery of the shutters. The method of joinery appears in the plates of measured drawings, so that further comment on that score is unnecessary. In the matter of the belt course, however, it should be noted that the decoration of Greek key frets is made of cast iron. The units are small, and each unit is held in place by three screws at the angles. These screws are fastened into wooden wedges that had first been driven into the mortar joints between the bricks, the stucco being applied afterwards. No trace of color or of paint of any sort now remains on the iron frets. Their surfaces

Photos. Frances B. Johnston and Harold D. Eberlein

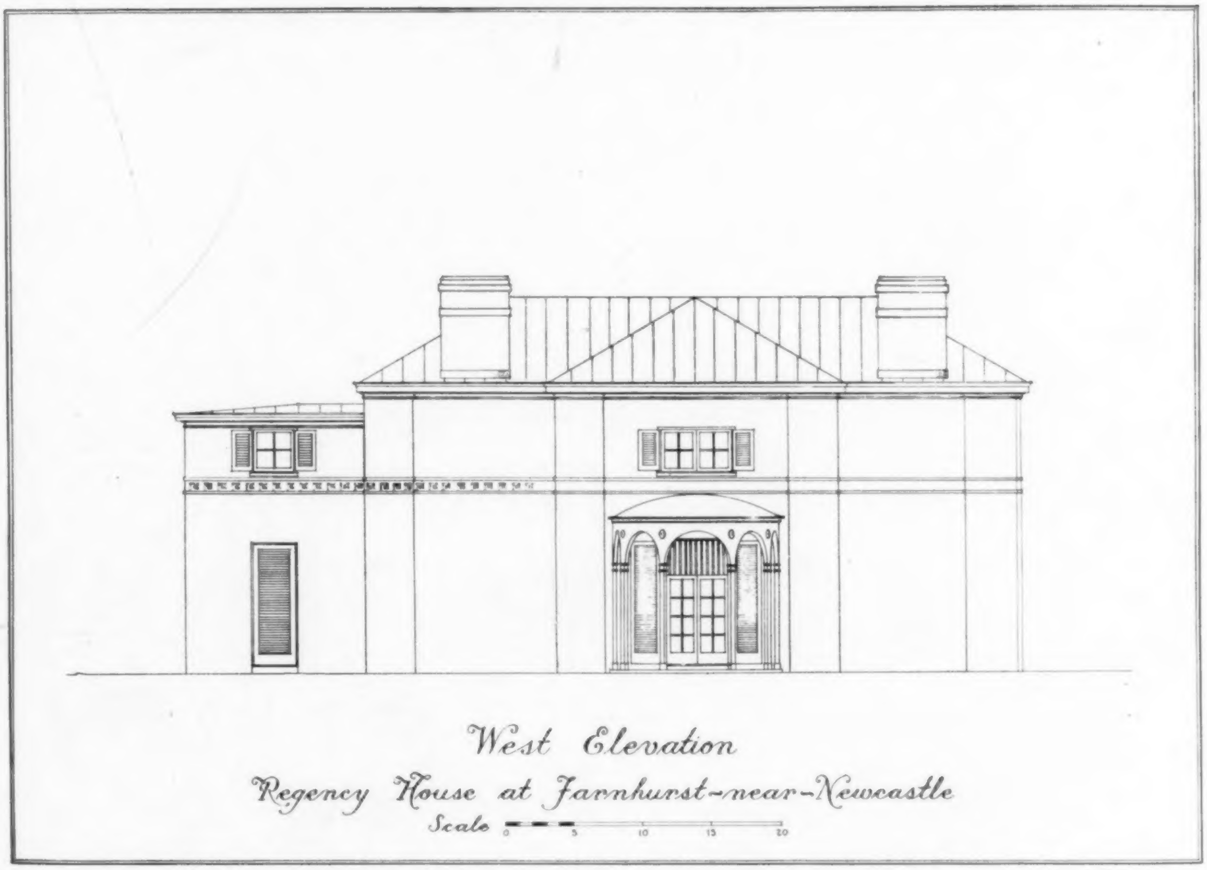
South End

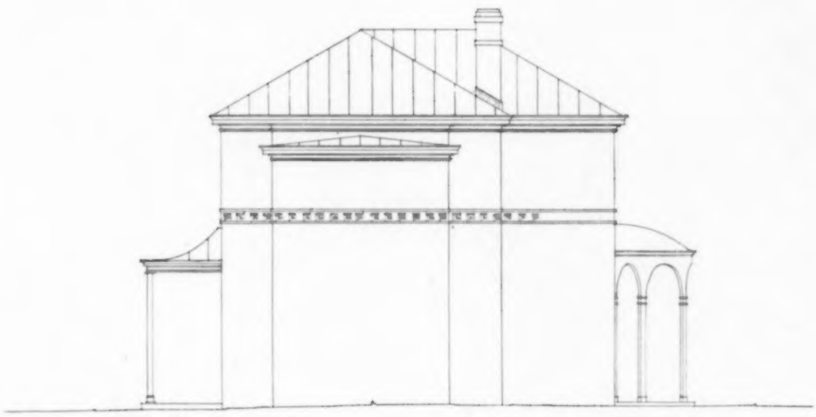
West Portico

The East or River Front



The West or Garden Front





North Elevation

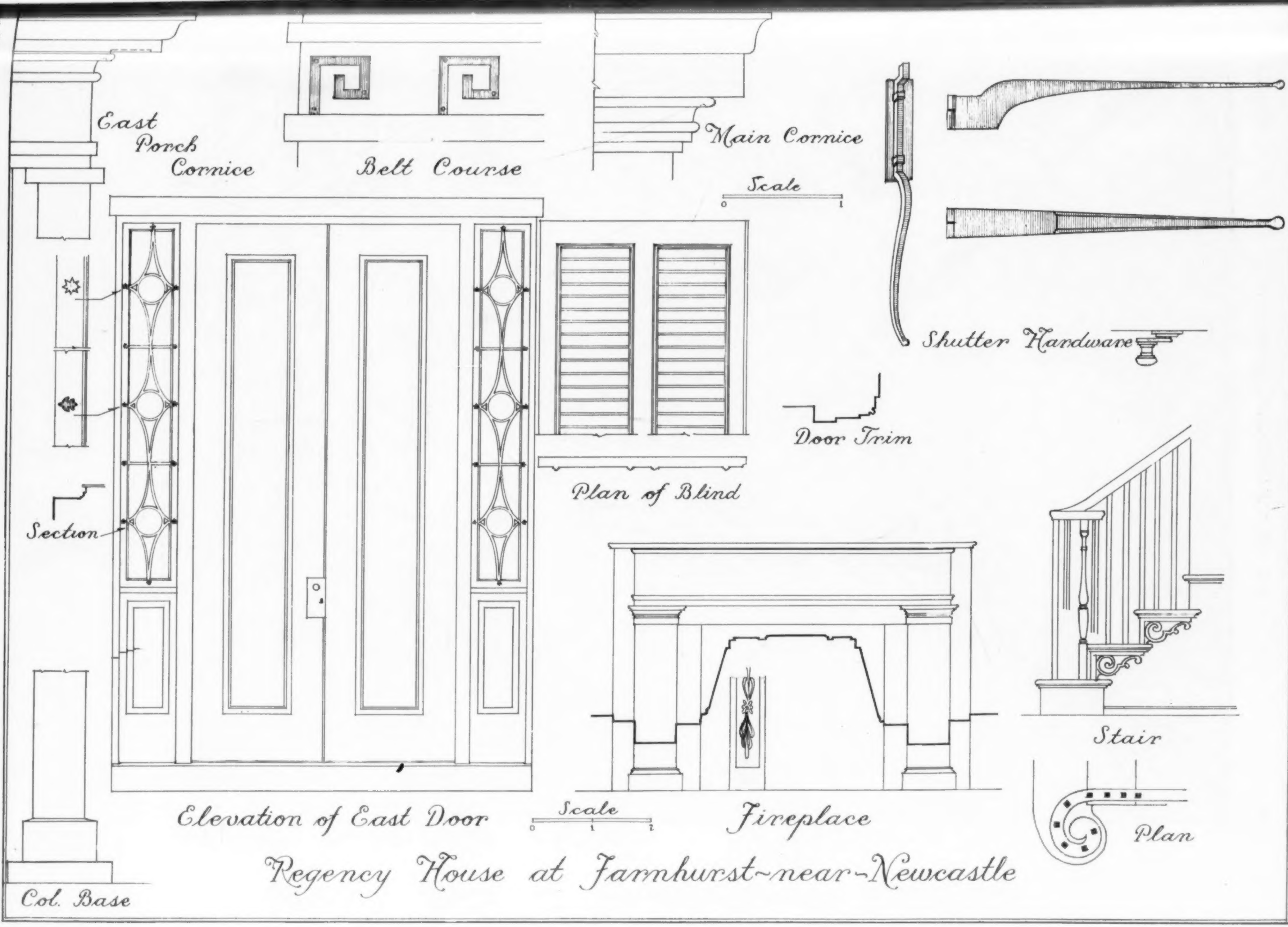
Regency House at Farnhurst-near-Newcastle

Scale 0 5 10 15 20

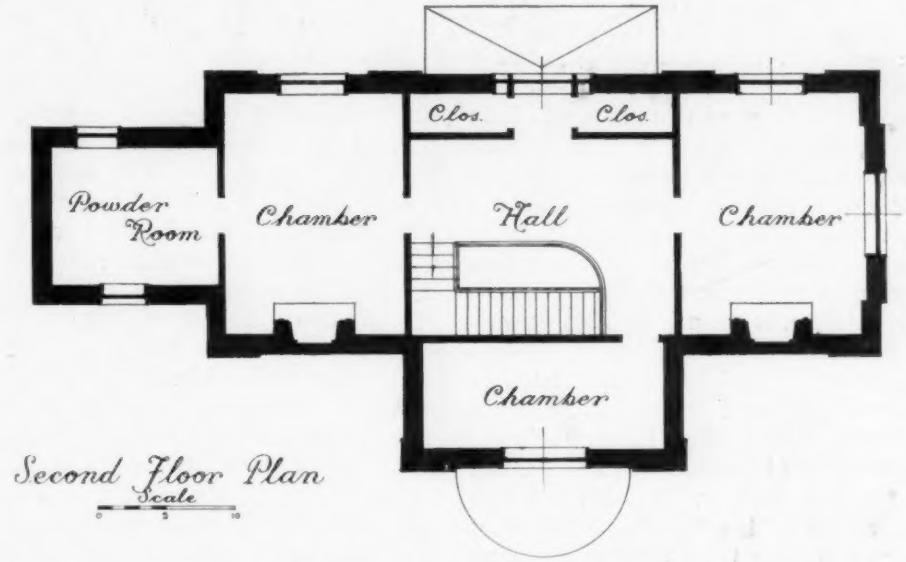
South Elevation

Regency House at Farnhurst-near-Newcastle

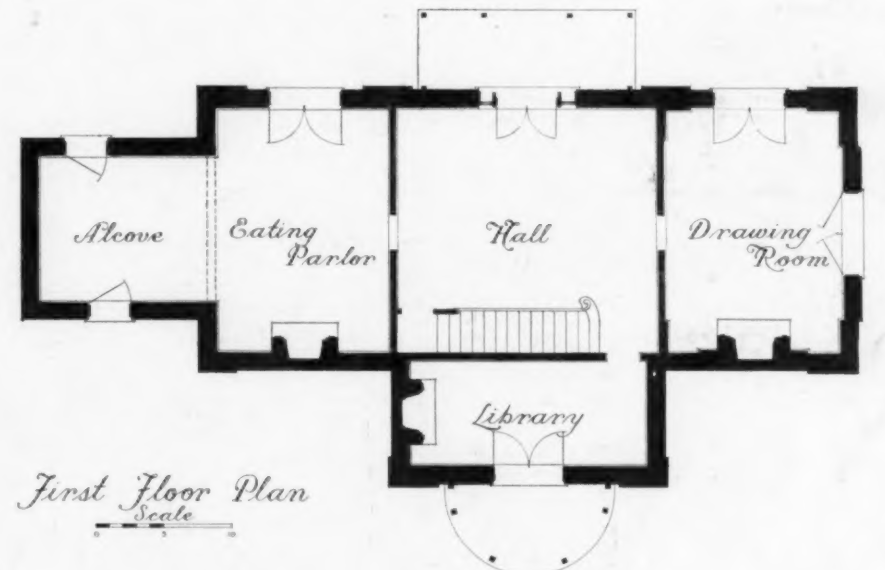
Scale 0 5 10 15 20


East Porch Cornice
Belt Course
Main Cornice
Scale
0 1
Shutter Hardware
Door Trim
Plan of Blind
Section
Elevation of East Door
Scale
0 1 2
Fireplace
Stair
Plan
Col. Base
Regency House at Farnhurst~near~Newcastle

STAIRWAY, REGENCY HOUSE AT FARNHURST-BY-NEW CASTLE, DEL.



Regency House at Farnhurst-near-Newcastle



Regency House at Farnhurst-near-Newcastle

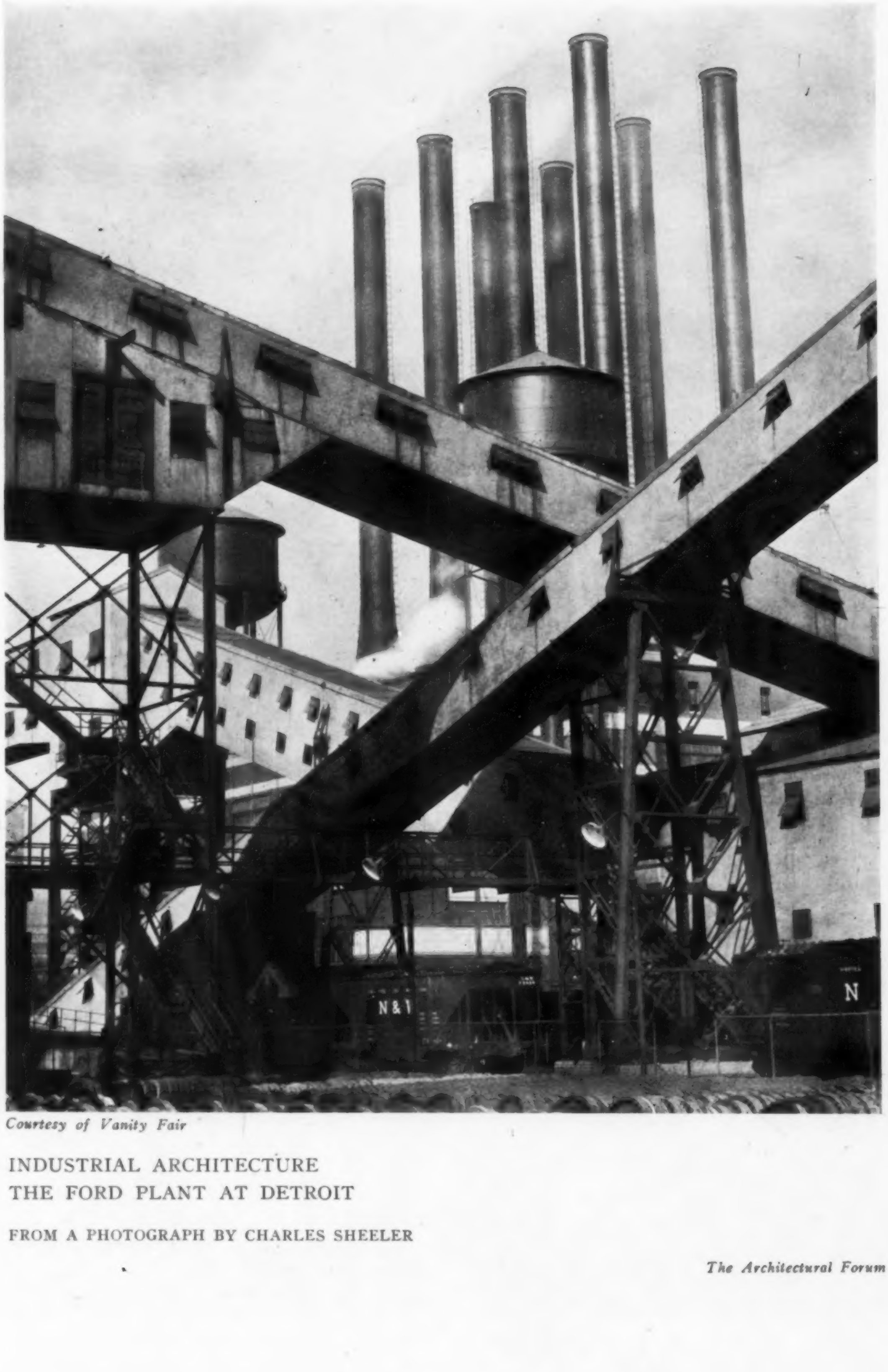
projected from the face of the stucco and, in all likelihood, they were originally painted black or, less probably, of a color to correspond with the stucco.

The main entrance seems to have been originally on the east front, facing the river, access being through the veranda and the wide door into the hall. What was the layout of the surrounding grounds, it is now impossible to determine. There are still traces visible here and there of what seems to have been a regularly plotted garden with definite form to the south of the house and immediately before the south window of the drawing room, but they are only the merest traces and not sufficient to make possible the reconstructing of a plan. The only feature of which enough vestiges remain to conjecture fairly accurately its lines, is the drive. This appears to have come in from the west and then to have made a circling course around to the river front of the house, whence it continued its curve to the coach house on the north. It also seems likely, so far as one can judge from the remnants of the planting, that there was once a broad vista from the east front of the house toward the river, the straight lines of the trees diverging from the house wedge-wise with the head of the wedge at the farther ends of the groves. For the rest, there is only one lone box tree beside the west portico as a reminder of its symmetrically placed fellows, some of which the present occupants say were still living when they came to the place 14 years ago.

One exceedingly interesting and subtle feature of the composition is the way in which the corner pylons of the west and east fronts immediately at the angle become flush parts of the north and south walls, while these walls break forward across the center in the portion containing the windows. It is also worth noting how the height of the belt course increases the scale of the house. The rather exceptional measurements of the glazing are worth observing; the panes in the south casement of the drawing room are 12 inches by 22. These in the east casements are the same in height, but narrower to accord with the narrower window opening. The muntins are uniformly ⅝ of an inch in thickness. This was the usual width prevalent at the period. The paving of the west portico is of brick, that of the east veranda of squares of white and gray marble laid chequerwise. The portico and veranda columns stand on white marble plinths.

It is a curious fact that the detail of the woodwork inside the house does not correspond in refinement with the exterior detail; this includes the inner detail of the casements, which is of the same character as the exterior work. In fact, the interior detail is much coarser, less studied and rather dull. The explanation seems to be that the outside of the house was finished at the period of erection while, for some cause now unknown, the finishing of the interior was postponed to a later date when the heavier influence of the purely Greek Revival began to make itself very perceptibly felt. It seems impossible to believe that the exterior and interior details could have been designed by the same hand or, at least, designed at the same time. Whether the stuccoed surface of the outside walls was ever painted or not, it is now impossible to say. In any event, the surface was smoothed with care, and the structure always displayed an aspect of extreme suavity. In these days of exaggerated plaster textures, very obviously and laboriously smeared and dented in order to produce meretricious "artistic effects" for exteriors, it is a relief to find the dignified, restful placidity of a wall surface such as that of this little Regency house in Delaware. Its reticence and dignity render it acceptable as a model for present-day country house architecture. It possesses a charm which is enduring.

Old Coach House, Farnhurst-by-New Castle, Del.



Courtesy of Vanity Fair

INDUSTRIAL ARCHITECTURE
THE FORD PLANT AT DETROIT

FROM A PHOTOGRAPH BY CHARLES SHEELER

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER TWO

AUGUST 1928

ARCHITECT AND CONTRACTOR, CO-WORKERS

BY
A. KENNETH McKEAND*

SO swift has been the pace in the development of modern building construction that there has been little opportunity to pause and ask ourselves where we are headed for, what landmarks have been passed, and whether we are moving forward in an organized body or in splendid, but unrelated, units. Progress, unbelievable progress, has been made, obstacles overcome, victories won, in which the owner, architect, engineer, contractor and manufacturer alike have each played an important part, and it is only human that each should ascribe to himself the major part in the achievement, and only partially realize that without the others, his efforts would have been unavailing. Nevertheless, the realization of this mutual dependence must be grasped if the fullest use is to be made of the opportunities that lie ahead, and it is the purpose of this article to show in what way the contractor is qualified to take his place in the councils of the leaders in this development, and to set forth the services he is prepared to render.

In the same relation that the "charge of the six hundred at Balaklava" stands to modern warfare, stands the "builder" of 50 years ago to the modern engineer-contractor of today. His function has changed from that of a master-mechanic, who by dint of leadership and ability could bring together the few simple factors entering into the smaller building operations of the period, to that of an expert controlling a diversity of elements over a wide field, and coördinating them into one comprehensive plan of action. The builder has not been alone in adapting his services to rapidly changing conditions. The modern architectural office bears as much resemblance to that of 50 years ago as a building of the '70's to the last word in steel construction today. Paradoxically, it is the very complication of mechanical and engineering problems that has given back to the architect-designer his true place in the structural scheme, and just as he has met the challenge of the zoning laws by creating new æsthetic formulæ, so did the limitations imposed on him by structural necessity prove the stepping stones to achievement that is the wonder of the world. To him we owe the evolution of the "skyscraper" from something of harsh utility to a form of challenging beauty. But the days have passed when he can claim for himself the sole honor in the creation of a building. As the factors entering into even the simplest of structures have increased in number and multiplied, he has surrounded himself with specialists in many fields, and his principal function is now to correlate the requirements of these experts into one coherent design.

A similar change has meanwhile taken place in the builder's organization. Contrary to popular conception, he is no longer a mere vendor of building. If his functions were simply to erect steel, brick, or concrete, he could be dispensed with and his place taken by a competent foreman. In other words, the essence of modern general contracting lies not so much in the furnishing of labor, materials and equipment, and the brokerage of subcontracts, as in skillful, centralized management for coördinating the work of many different trades, timing, organizing and synchronizing the installation in accordance with some predetermined plan. The experience, knowledge and data that he has gained in the exercise of these functions are what he offers to owner, architect and engineer,—not only in the execution of the plans, but in every stage of the development of the structure, from the preliminary sketch plans of the architect to turning over the completed building.

And yet what too often happens? How frequently have we all seen completed drawings, so cluttered with changes, corrections, contradictions and addenda that it might be presumed that their function was to mislead rather than to guide anyone in their execution. What usually do these last-minute changes represent, if not a belated realization that the owner's and architect's rather vague assumptions as to costs have been unduly optimistic? And so commences the business of cutting, slashing and slicing that will bring the emasculated project within the size of the financial budget. The cities of this country are full of monuments to this wasteful method,—their owners contemplating an ever-growing array of red figures on their ledgers, and their managers floor upon floor of empty offices. The data that would easily

*The author acknowledges indebtedness to Col. W. A. Starrett for aid in the preparation of this article.

Building for Industrial Trust Co., Providence
Walker & Gillette, Architects; George Frederic Hall, Associated
Built for Fixed Fee; Guaranteed Cost Limit
Starrett Bros. Inc., Builders

Building for National City Company, New York
McKim, Mead & White, Architects
Built on Cost Plus Percentage Basis
George A. Fuller Co., Builders

have allowed them to "cut according to their cloth" were in the hands of the builder, but he was not invited into conference. He was being held off until such time as the elimination race should be held which would produce a builder who could in some way construct identically the same building for less money than his competitors!

It would not be hard to imagine the disastrous consequences if a similar competitive method were used in the selection of an architect,—whereby men of varying ability, integrity and responsibility would be called upon to produce plans for a building, to meet certain stipulated requirements,—the award being made solely on the basis of the price at which the design could be produced. And yet the analogy is not so far fetched, for it was precisely out of the system of competitive bidding that there arose the idea that the general contractor was necessarily dishonest, usually unscrupulous, and only to be trusted when closely confined in a straitjacket of rigid plans and specifications and subjected continually to the most vigilant inspection. That such should be the outcome was inevitable, when price, rather than experience or ability, was the deciding factor, and where a builder's instinct for gambling,—on loopholes in specifications, on lax supervision, on probable changes and extras, or a turn in the market,—was of more value than an accurate analysis of building costs. If fortune favored the successful bidder, he pocketed the savings; if not, he was faced with the alternatives of losing money or "skinning" the work, and the interests of owner and builder became as far apart as the poles. The wonder of it is that things have worked out as well as they have under such contending forces, and it is to the credit of both that so many of these alliances have not ended in disaster. But gradually there is awakening a realization of the fact that coöperation and identity of interest between all parties engaged in a building enterprise are of infinitely more value than all the inspection and coersion in the world; and thus the true function of the builder is being established,—as a co-adviser with the architect in the development of a structure, as a cost expert, and as one whose knowledge and experience of practical construction, gained through personal experience in the field, will be applied to produce the best results with the greatest economy of expenditure.

However, the old idea is slow in dying, and its lingering is one of the greatest causes of waste in the building industry. A single example will suffice. One of the largest manufacturers in the allied automotive industries decided on the erection of a new plant to cope with the rapidly expanding demand for his product. Plans were drawn, and bids were invited from about ten of the leading builders. No action was taken on receipt of the bids, but several months later a new scheme was developed and submitted for competition. In all, five distinct and separate schemes were estimated on by all bidders before the contract was awarded. When it is realized that aside from the builder's own organization, estimates

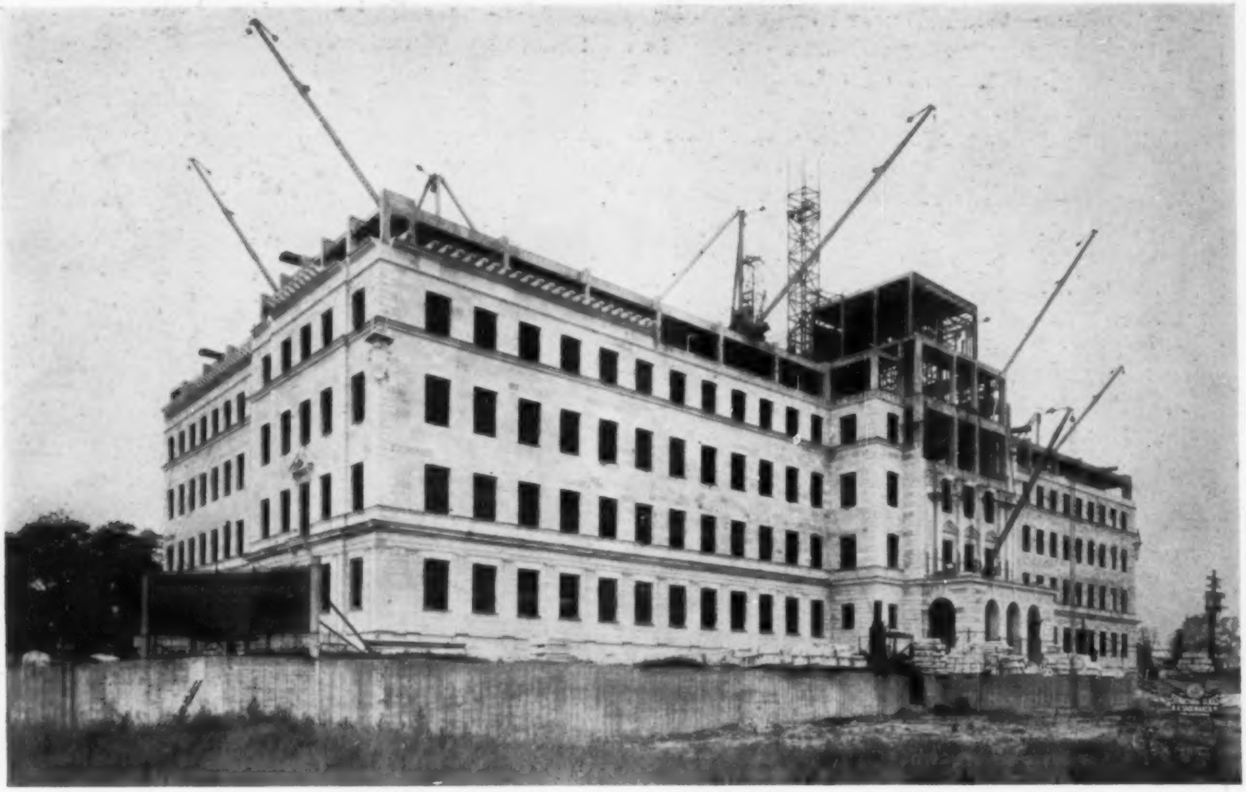
New Jersey Bell Telephone Building, Newark
Voorhees, Gmelin & Walker, Architects
Built on Cost Plus Fixed Fee Basis
Turner Construction Co., Builders

Building of Equitable Trust Co., New York
Trowbridge & Livingston, Architects
Fixed Fee, Guaranteed Limit of Cost Basis
Thompson-Starrett Co., Builders

from 30 or 40 subcontractors were necessary to complete each one of these bids, some idea of the prodigal waste entailed by such a method can be gained,—waste, incidentally, which must be paid for indirectly by the owner in increased building costs, due to the heavy burden of overhead borne by builder and subcontractors alike. What was the alternative? Each one of the builders invited to bid was the potential successful bidder, to whom would be entrusted the faithful execution of the plans. As such, the ability and integrity of one and all should have been beyond question. It is probable that from among the ten builders, some one would have been particularly desirable, through experience in similar work or because of intimate knowledge of local conditions. The owners had much to gain and little to lose by taking such a man into their confidence, making him an interested participant in the enterprise, and compensating him for the experience and pertinent knowledge he would bring to the development of the project,—presuming of course that the owners knew what they wanted and intended to build in good faith. If there were any question in their minds as to what their requirements were, or if economic considerations made the consummation of the project uncertain, there was all the more reason for eliminating useless competition. Not to have done so would, in any industry outside of construction, have savored of sharp practice.

Right here there is one of the weakest links in the building chain. To every one *bona fide* project on which bids are invited, there are several the probability of the execution of which is, to say the least, remote; but however slim the chances are, the owner usually feels perfectly free to put into motion the whole machinery of competitive bidding, whereby he will command the services of several highly trained organizations, without assuming any obligations or compensating them in any way for the time devoted to his project. Much has been said and many suggestions made of ways to cope with this obvious injustice, but the whole underlying cause is the prevailing notion that the only safe and economical way of securing the services of a builder is by competition. Often if the owner knew the reasons actuating the lowest bidder, he would realize, once and for all, the fallacy of such a method and gain some idea of the true functions of the legitimate builder. For, in the last analysis, the cost of a building is the sum total of a certain number of elements,—each comprising labor and material,—and true economy can only come from competent management and organization of the first and from careful, intelligent buying of the second. Given these, a building will cost what it will cost and cannot be made to cost less by any juggling of figures, and this is the price the owner should be prepared to pay. By so doing he will obtain the best and most economical results; there is no way of getting something for nothing.

This method of procedure brings us at once into



Building of Provident Mutual Life Insurance Co., Philadelphia
Cram & Ferguson, Architects
Built on Cost Plus Fixed Fee Basis
Turner Construction Co., Builders

the field of the "cost-plus" contract. Much has been written on this subject, but still the idea prevails,—among public officials, on building committees, and even among certain architects,—that under a cost-plus contract competition is almost or entirely absent, and that the builder has *carte blanche* to pile up expenditure, with little control by the individuals whose money is involved. If this were true, Barnum was indeed justified, because literally billions of dollars have been expended on building construction under the cost-plus form of contract. Fortunately, it is not the credulity of these owners which is in question, but that of the gentlemen who believe that such a method of procedure could have survived one single trial. There are several variations in the form of the cost-plus contract, but the main procedure under all remains the same. The original method compensated the builder in the form of a percentage of the actual cost; but as this was seen as a possible inducement to the builder to run up the cost, it has largely been superseded by a fixed fee, based on the probable cost, as estimated at the outset of the project. Here we have the true professional basis and the foundation of all great economies of construction. Of late years there has been added, as a further protection to the owner, a "guaranteed limit" clause, whereby the builder guarantees that the cost of erecting the building in accordance with the contract plans and specifications will not exceed the amount of his estimate, and assumes responsibility for payment of any excess over that amount. Once again it will be seen that the gambling element has been introduced, but it is gambling with full control of the circumstances and with all the cards on the table. As additional compensation to the builder for such risk as he is running in guaranteeing the cost, and to identify his interests even more closely with those of the owner, he is sometimes allowed a percentage of the saving realized below the upset price. Incidentally, it may be said that the builder who under any of the conditions outlined here fails to regard the interests of the owner as his own, has no place on any building enterprise under any contract.

Several questions may here suggest themselves to the reader. How is the guaranteed cost arrived at? What items of the builder's supervision are directly chargeable to the work, and what are included in his fee? How much of the work is done directly by the builder's own organization? How is competition secured among subcontractors, and what control is exercised by the owner and architect in the letting of subcontracts? How are changes and extras handled? How and when are payments due? There are others, but these are the main items on which the prudent owner will desire to be informed.

First. Upon completion of the final plans and specifications, an itemized estimate will be prepared, giving particulars of all estimates from subcontractors and that portion of the work to be executed directly by the builder, in full detail. To the total of these figures will be added a sum, not usually in excess of 3 per cent for contingencies, and the lump

Photo. Tebbs & Knell, Inc.

Hearst Publication Building, New York
Charles E. Birge, Architect
Built on Cost Plus Percentage Basis
Turner Construction Co., Builders

fee previously agreed upon. The sum total of all these items will represent the guaranteed limit of cost.

Second. As a general rule, no part of the general overhead, nor the service of any officer of the contractor, is chargeable as cost, and only the salaries of such men as are actively engaged on the building site or on actual expediting in the field, are paid by the owner. A careful examination by the writer of the records of some 20 projects revealed the fact that the costs under this head may vary from less than 1 per cent of the total expenditure on a fair sized office or loft building, to as much as 3½ or 4 per cent on a smaller but more intricate structure, where the work must necessarily proceed more slowly, and where the supervisory requirements would be as great as for a building involving two or three times the expenditure. These minimum requirements, on a building costing up to a million dollars, may roughly be taken to be a force of four or five,—superintendent, assistant superintendent (or "job runner," as he is sometimes called), timekeeper, material clerk, and stenographer; with the addition of an engineer, expediter, cost clerk, plan clerk and time and material checkers as the size and complexity of the operation increase, until on a building involving from ten to fifteen million dollars, a force of 20 or 30 may be legitimately employed in expediting completion of the structure.

Third. Under present practice, the majority of responsible builders execute not more than 20 per cent of the work with their own organizations. This will usually consist of the concrete work in the foundation, the masonry work, and the rough carpentry. These items play so important a part in the progress of the building that it is essential that they be under the direct control of the general contractor. Bids are taken on all materials entering into this work, and there is left, therefore, only the actual cost of the builder's own labor as a non-competitive element.

Fourth. The remaining 80 per cent consists of subcontracts and equipment purchases, awarded after intelligent competition among carefully selected bidders in each trade. These bids are tabulated and submitted, with the builder's recommendation, for the approval of the owner and architect before any obligation is incurred. The owner, however, is free to designate any subcontractor or material purchase he may favor, and, should the amount be higher than the figure recommended by the builder, the guaranteed limit would be increased by that amount.

Fifth. Detailed estimates of all proposed changes and extras are submitted to the owner and architect for acceptance. If approved, an architect's authorization is issued to the builder, increasing the upset price by the amount of the estimate. In this way, an owner is kept constantly aware of the money value of his decisions, and has the satisfaction of knowing that he will be called upon to pay only the actual cost of their execution. Thus one of the most constant sources of friction and irritation between owner and builder is removed, and a decision which,

under a lump-sum contract, might involve days of wrangling and subsequent delay, can be had at once.

Sixth. Reimbursement to the builder, together with a proportionate share of the fee, may be made monthly or, where a building is financed by means of a mortgage bond issue, at certain specified stages in the erection of the structure. In either case, the builder will have to support the amount of his application by receipted vouchers, invoices, payrolls, etc., in an amount equal to or in excess of the amount of his application, before any further payment is made.

How, then, does this work out in practice? The writer has in mind a building, costing around five million dollars, recently completed to the entire satisfaction of the owner, architect and builder,—a happy combination rarely achieved under the competitive form of contract. The builder was called in shortly after the selection of the architect and when there was nothing more than the sketch plan of the building. From these sketches and memoranda specifications, a preliminary estimate was made, to give the owner an idea of his commitments and to guide the architect in the execution of the plans. The architect availed himself from the outset of the practical knowledge of the builder, and in close collaboration the main structural features of the building were decided on and the excavation started. As soon as the scheme was sufficiently developed to permit complete structural steel plans to be made, figures were taken and a contract for fabrication let. Had it been necessary, as in the case of a lump-sum contract, to await the completion of the final plans and specifications before the letting of even the general contract, a loss of time amounting to between two and three months would have been inevitable. As it was, in view of the close collaboration from the beginning between all parties concerned in the financing, designing, erection and operation of the building, the risk of radical changes in the steel design was slight, and the owner was compensated for such minor changes as were called for in the working out of the detailed drawings, by a much earlier completion date.

The advantages resulting to the owner from such a contract as here described may be summed up as:

First. Saving of valuable time in starting the work and securing a much earlier completion date.

Second. Economics in construction, which unquestionably resulted from the combined knowledge of the architect and builder.

Third. Complete knowledge on the part of the owner of every measure taken for the advancement of the project, with the interest of all parties enlisted.

Opposed to this picture is another which was recently brought to the writer's attention. A small but sound banking institution in the west decided on the erection of a new home office to house its growing needs. A certain sum of money was set aside for the purpose, and a nationally known architect engaged to draw up the plans. He produced a scheme which seemed in every way to meet their requirements, at a cost, he assured them, that would not exceed the amount of their budget. On his advice, in order to save time and to take advantage of prevailing market conditions, he was authorized to let certain contracts direct, before the selection of the builder was agreed upon. When bids were taken for the remaining portion of the work, it was found that the figure of the lowest bidder was almost twice what they had anticipated. There was no question that a creditable building, adequate to their needs, could have been erected within their budget. But it was too late!

From this it may well be seen that coöperation cannot start too soon; frequently it comes too late; often, alas, not at all,—and the owner is deprived of one of the most valuable forms of service that the builder can render. There is no substitute for the experience and mature judgment that the able builder will bring to the conference room, and it is here, just as much as in the field, that his knowledge of ways and means and the cost thereof will clarify the problem and help toward wise decisions. Let the owner, then, select his builder as he does his architect,—for his reputation for honesty and integrity; for the services his training and ability have qualified him to render; for his record of past and present achievements,—and make such an arrangement with him that his concern shall be enlisted solely in building wisely and well. In so doing the owner will sow the seeds for a most fertile and effective collaboration.

Residence at Valhalla, N. Y.
Mann & MacNeille, Architects
Built on Cost Plus Percentage Basis
Barr & Van Buskirk, Builders

ARCHITECTURAL USE OF CAST STONE

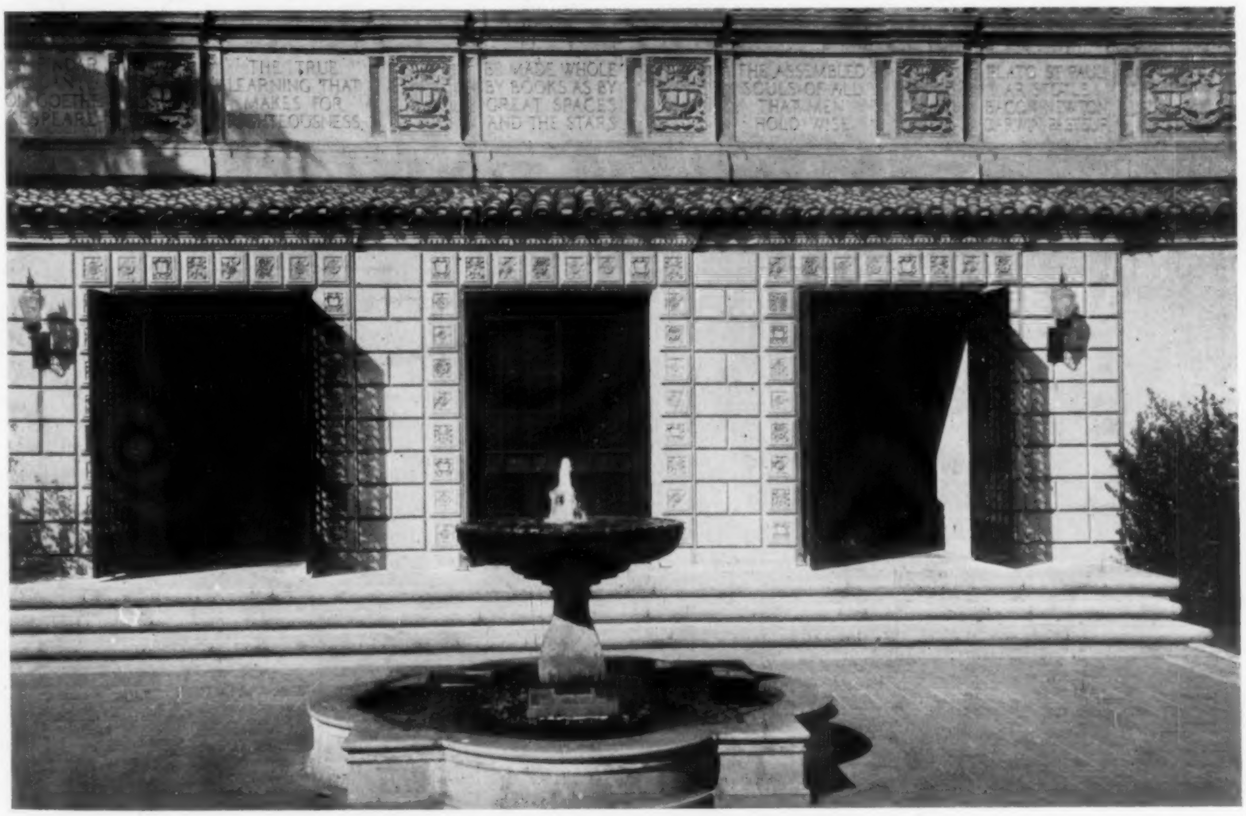
BY

JOSEPH B. MASON

THE chief obstacle to architectural use of cast stone in the past has been the difficulty architects have found in specifying this material. Adoption of standard specifications should remove this drawback. Thirty-four of the leading manufacturers of cast stone, art marble and similar products met during a recent conference of the American Concrete Institute at Philadelphia and agreed to form an Association of Cast Stone Manufacturers, the first task of which will be the establishment of standard specifications for cast stone. Another task of the new Association, we are told, will be the elimination of the confusing multiplicity of names now used to describe the various concrete stones on the market. So rapid has been the development of the use of cast stone and allied products in the past few years that we can hardly afford to longer ignore the fact that for certain purposes and under certain conditions their use is practical and desirable. There is a place for these products, and it would seem that those architects who have not already familiarized themselves with them should do so now, if for no other reason than that they desire to keep abreast of developments in the profession. Natural stone is and probably will continue to be satisfactory, but this fact does not preclude the development and use of interesting new cast stone products which have a wide range of uses. At least let us make ourselves aware of the possibilities that lie in their use.

One of the handicaps that manufacturers of cast stone have had to meet is the prejudice of some architects unfamiliar with the product, who regard it as imitation of natural stone and who, from lack of information, are not willing to believe that it has merit of its own. Many architects feel that there is only one reason why the use of cast stone should be considered, and that is its low price. This I do not believe to be true. There is a place and a use for cast stone on its own merits alone. The colors, textural effects and structural qualities of cast stone scientifically made are such as to meet an architectural need which, regardless of price, makes its use desirable. Then, too, there are instances where a particular color or quality of stone is required for a particular use at a time when other surfacings meeting these qualifications are absolutely unobtainable.

I have in mind an architect who wanted to use a certain buff sandstone on winter work which it was imperative be rushed to completion. The quarries from which this stone could be obtained were closed, and it was impossible for him to get it at any price. Here was a case where he was forced to call upon



Cast Stone Facing and Trim, Pasadena Public Library

Myron Hunt, Architect

Intricate Design in Cast Stone, Fine Arts Building, San Diego
Templeton, Johnson & Snyder, Architects

the makers of cast stone. He got in touch with a manufacturer who studied the problem and prepared a variety of samples. Absolute control of color and texture made it possible for the manufacturer, coöperating with the architect, to produce a cast stone of the exact nature desired, at a cost somewhat under that of the product which the architect had been making such a strenuous effort to obtain. It was no reflection on the competing material; it was, however, a demonstration of the triumph of man's ingenuity over nature and the barrier she has long maintained. Coöperation with architects is activity which forward-looking manufacturers of cast stone have encouraged in recent years to their advantage. The larger and more reliable companies now maintain drafting departments and consultants with a thorough understanding of architectural detail to render service to the architect and builder. This department assists in the selection of design of the various types of units. It assists in the preparation of estimates, in the taking of measurements incidental to the designing of special pieces, in the preparation of samples, of large scale drawings correctly interpreting the architect's plans, and in many other matters. Clay models are made up to be approved by the architect, either by actual inspection or by photographs.

In fact, the making, marketing and placing of cast stone have become a very complex and scientifically controlled industry. The constant effort of several of the larger manufacturers who for more than 20 years have been striving to raise the standard of the industry and the quality of its products, has been largely responsible for its strength today. The years of experiment and trial have developed scientific procedures which leave very little to chance. The careful selection of aggregates; the care in grading to secure utmost density; the crushing which is designed to give a cleanly broken or shattered aggregate rather than a pulverized material; the scientific application of thoroughly tested formulæ for both color and proportions; and in general the exactness and thoroughness of the entire process which places it on a high plane of mechanical perfection, make the cast stone products of today tangible, definitely known quantities which can be relied upon.

It is the men who are scouring the country for unique and beautiful natural stone to use as aggregates, who employ geologists and chemists as well as other competent technical men to assist them in making a stone which is in itself unique and beautiful, who interest me. In his heart no architect likes to or wants to imitate one material in another, and usually he will do so only when forced to for economy's sake. It can be done, as in the case I have mentioned, but it is not the aim of enlightened manufacturers to produce a cast stone that is merely an imitation. They realize that cast stone will not reach its highest development until it is recognized as a material having characteristics of its own of definite quality and capable of producing definite results both artistically and physically.

It is in the selection of the aggregates which they use in making cast stone that manufacturers are escaping the stigma of imitation. They search the country over and even hunt out the forgotten quarries of foreign lands in an effort to get stones. The result is that now they are giving us cast stone with colors and textures long ago given up by architects as being impossible to secure. A certain western manufacturer of cast stone recently employed a corps of geologists and conducted a minute search through a dozen states within shipping radius of his plant. In this search he found a number of natural stones with proper degrees of durability, hardness and texture, and what is extremely important, of proper color. He is now operating eleven small quarries which enables him to make cast stone of remarkably attractive color and texture. Many of the world's most beautiful natural stones, and those most desirable because of their durability and hardness, are no longer obtainable because of their scarcity or extremely high cost. Cast stone manufacturers are making a definite effort to supply architects with stone of this character. Igneous stones, occurring in broken or irregular veins so that they cannot possibly be quarried in pieces large enough for architectural use, are employed for this purpose. They are often taken from distant and sometimes almost inaccessible deposits, but the expense is justified in the quality and individuality of the product thus secured.

Much of marble as well as other expensive stones are obtained almost entirely from foreign quarries. They are selected for color and texture in addition

to the qualities which will produce a cast stone of strength and durability. Color is of course a very important consideration. The best cast stones are those which rely for their tints upon the natural color of the selected aggregates. Mineral pigments are used in small quantities to shade the cement mortar, but it is upon the natural hue of the aggregates that most cast stone relies for its colorful effect. Combining different shades of crushed stones or marbles according to formula, the producers obtain color effects which heretofore have been obtainable only in very rare natural stone.

To go into the extensive details of manufacture of the numerous forms of cast stone would convey a convincing picture of the care with which the products are made and would undoubtedly raise their standing in the eyes of architects who appear to believe that they are thrown together in a most haphazard manner. But such a description would be beyond the scope of this article. It will be enough for me to point out that the investment in machinery, equipment and buildings in a modern cast stone plant in many cases is in excess of half a million dollars, that the average for 200 plants is somewhat over $40,000 each. These companies, equipped as they are with efficient and complex machinery, take elaborate precautions in the selection and grading of the materials, in crushing, and in the final preparation and mixing of the concrete. Extensive systems of moulds, great curing rooms, and powerful finishing machinery are required. The largeness of the investment and the reputation which the manufacturers are building up slowly but surely, make it imperative that they supply reliable, satisfactory stone, and make them willing to stand behind the product with a guarantee that should please the most exacting purchaser.

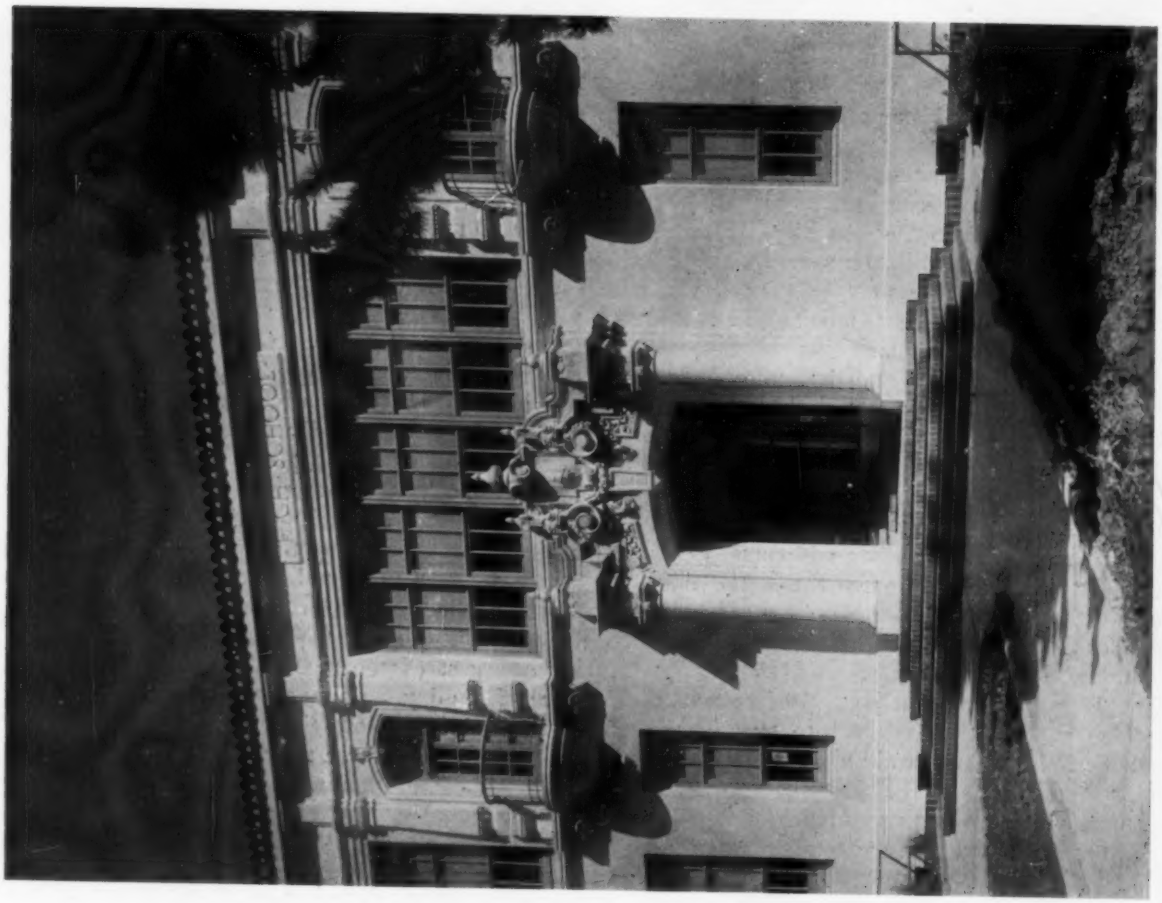
One of the interesting characteristics of cast stone is its adaptability to receiving numerous surface treatments. After proper curing, the flint-like product may be tooled or dressed in the same manner as natural stone, or the surface may be treated with acid to give an exposed aggregate effect. The architect may decide upon a particular color and textural surface, go to a manufacturer, and through coöperation with his service department perfect a stone which will exactly meet his requirements. Many of the manufacturers not only assume the task of perfecting a surface material which will exactly meet the need of any given work, but will assume the responsibility for installation. They will contract for the material in place and guarantee the installation.

I have said that cast stone has certain merits that make it desirable in itself, regardless of price. Before concluding I will outline some of its merits. First, I should say, is the close control of color and texture which enables the architect to specify the exact shade or finish he desires in a structure. Next in importance, possibly, is the fact that once the mould has been made, a given product may be turned out in great quantities at a constantly decreasing cost. That is, extensive ornamentation which calls for a repetition of a single pattern is possible at very low cost. From one mould hundreds of pieces may be made. Another excellent quality of cast stone is that it may be reinforced with steel so that it will carry a structural load while at the same time retaining its architectural value. The units are easy to handle, due to the fact that metal-carrying rings are embedded in the concrete before it sets. These rings are so arranged that when the unit is supported by cable it hangs at the exact angle at which it is to be placed. Cast stone may be made into most difficult patterns and shapes without incurring excessive expense, and it may be cast in thin, flat slabs of a size entirely impractical in natural stone. A piece having extreme projections in two or more dimensions may be constructed with comparative ease, whereas to carve such a pattern would require much labor and a block of enormous proportions. Another practical feature of cast stone is that individual units may be duplicated at any time, since both moulds and formulæ for color and texture are indefinitely preserved by the manufacturer.

Exterior Facing and Ornament of Cast Stone, Valhalla Memorial, Burbank, Cal.
Kenneth McDonald, Jr., Architect

The willingness of the manufacturers of cast stone to keep abreast of the most advanced architectural practice of the day is doing much to increase the use of their products. More than 20 years of development have given us these materials in a form which has been quite thoroughly tried and tested. The increasing emphasis on well executed architecture, significant decorative detail, and on color and textural effect, brings to the profession a need for such a product which is entirely logical and worth while.

CAST STONE ENTRANCE DETAILS
HIGH SCHOOL, GLENDALE, CAL.
J. C. AUSTIN, ARCHITECT



STUCCO EXTERIOR, TRIM OF CAST STONE
HIGH SCHOOL, HEALDSBURG, CAL.
W. H. WEEKS, ARCHITECT

NEW EFFECTS FROM COMMON BRICK

BY

R. S. TILDEN

THE past few years have seen a rather remarkable revival of architectural interest, as well as public appreciation, of common brick as an exterior facing material. Whatever may be the real reason, the fact remains that brick is, especially in the larger building centers, steadily becoming more generally used as a facing material. One of our prominent authorities has recently said that "there is no sound architectural reason why a building should not be brick from ground to roof." The underlying thought is that modern design, in its treatment of mass, tends toward the use of one material, and that brick is sufficiently flexible to permit the expression of individual ideas. It is possible that the examples commented upon in this article may offer suggestions to those interested in accomplishing such a result.

Foreign Brickwork Design. There is at this writing a very comprehensive exhibit of foreign architectural photographs on tour of the country, and the reception accorded this collection in such representative centers as New York, Chicago, Detroit, Cincinnati, Philadelphia and Boston is very conclusive evidence of the appreciation of its value to the architectural profession. Two examples are illustrated here, the first of which is the crematory of the city of Hanover (Fig. 1). While the principal interest to some may lie in the handling of brickwork in the mass, certain of the details of the masonry treatment deserve attention,—that over the doors, for example. The surface is broken by a gable-like treatment, and although each unit projects beyond that next below, all are set back from the face of the building sufficiently to give emphasis by deep shadows. The courses of brick in these projections are at an angle of 45° to the horizontal, while the courses in the cornice and similar points are laid vertically.

The bridge in the city of Hamburg (Fig. 2) shows a rather unusual treatment in the courses just below the coping. The header brick introduced into this basket-weave bond are cut out to a point. The curve of the abutment not only adds to the pleasing character of the design but shows the practical possibility of using curved walls, etc., laid to a comparatively short radius.

Rowlock Courses. The use of brick laid rowlock, or on edge, is not new but offers an opportunity for securing effects differing greatly in the matter of scale from brickwork laid in the usual manner. The bond in the example illustrated (Figs. 3 and 5) is the ordinary Flemish, with a rather wide "rough cut" joint which lends a distinct character to the surface. The entrance door detail shows that not only may

Fig. 1. Crematory at Hanover
Konrad Wittman, Architect

Fig. 2. Bridge at Hamburg
Fritz Schumacher, Architect

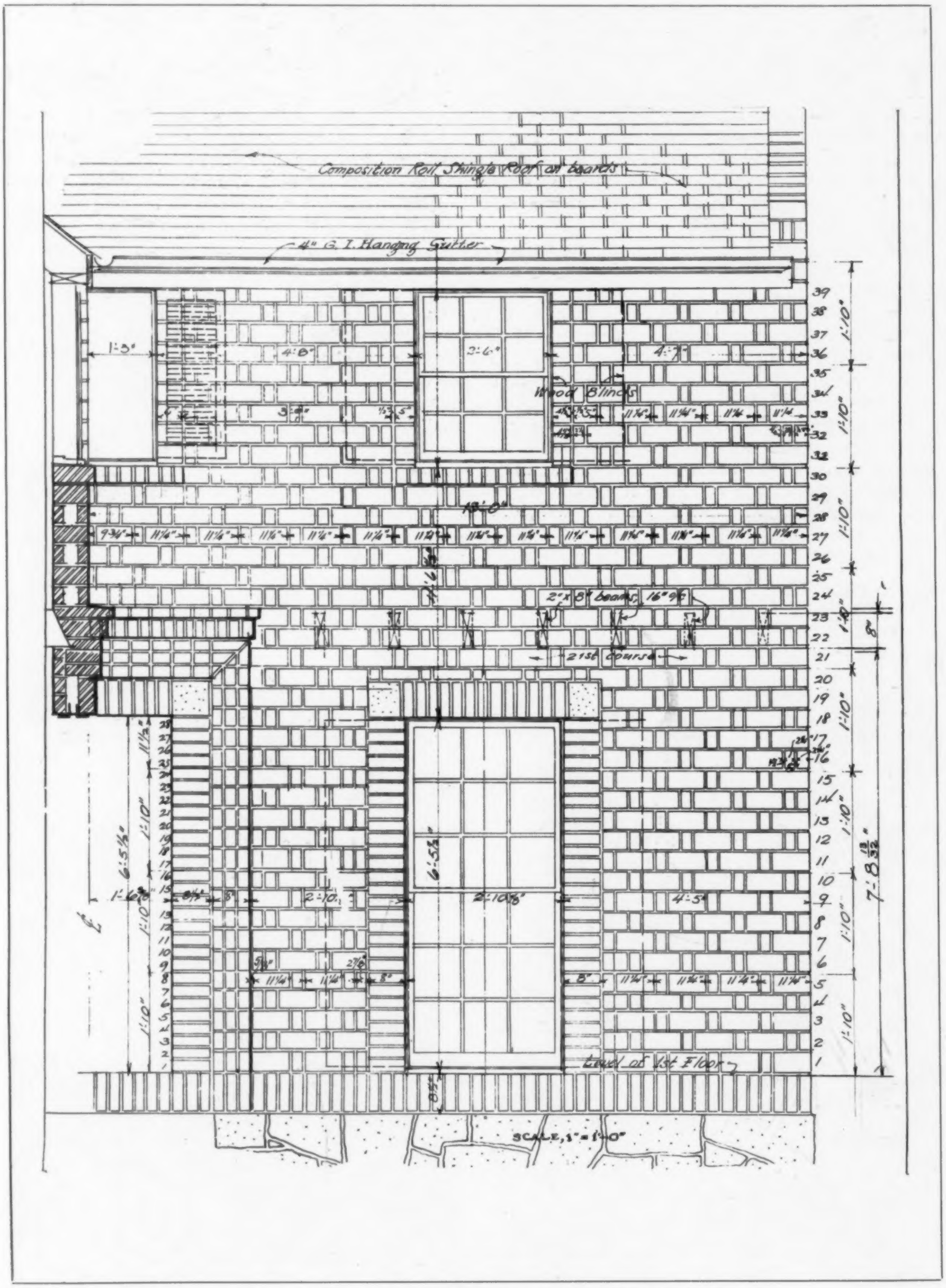


FIG. 3. DETAIL OF BRICKWORK SHOWN IN FIG. 5
HOUSE AT DOBB'S FERRY, N. Y.
THEODORE A. MEYER, ARCHITECT

Fig. 4. Chimney Detail
Grosvenor Atterbury, Architect; John Tompkins, Associated

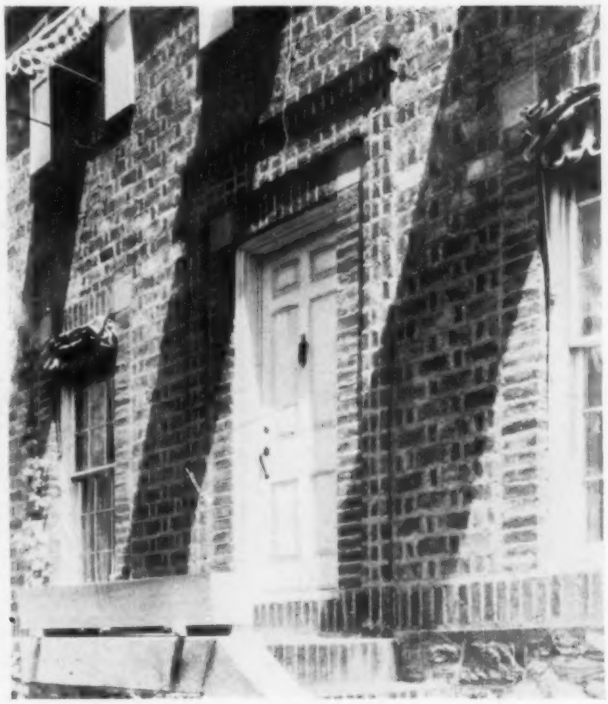


Fig. 5. Entrance Detail
Theodore A. Meyer, Architect

the wall surface prove attractive but that handling of simple projections may produce good results.

Chimney Decoration. The original conception of chimney brickwork serving simply as a protecting and enclosing material for flues is not universal, if some of the accompanying illustrations (Figs. 4, 6 and 7) may be considered evidence. That showing the central flue supported by two flues of circular shape indicates, at first glance, the use of specially shaped brick, but it is both possible and practicable to secure the "spiral" effect simply by projecting adjoining brick on successive courses. The chimney illustration (Fig. 7) showing the niche and the pattern work in the upper part offers a rather interesting sidelight on the frequently heard derogatory remarks as to present-day building trades workers. The bonds and patterns used in the chimney (and in the terrace floor as well) were only sketchily indicated on the details, the idea being to secure the interest of the workers by permitting them to choose the patterns to be laid in the various rectangles. The scheme was successful in obtaining better coöperation between designer and mechanic, not only insofar as this part of the building was concerned, but for the entire work. It might be noted here that the radius of the circular columns is 12 inches and that they are built up by first cutting individual brick in the form of a segment and then laying the column all headers. A help in reducing time required will be found in building a form of wood or other material whose inner diameter corresponds to the outer diameter of the finished column. The brick and mortar can then be laid within the form, one course high and, after setting, the entire course laid as a unit in the column. This same illustration shows, at the eaves of the gable wall, the introduction of "cut" or "splintered" brick, and a somewhat similar idea has been carried out in all of the walls. This is another instance where the exact design and location of these inserts were left to the fancy of the mason, who was not asked to follow any set pattern or to accept any predetermined spacing. The latitude allowed the bricklayer proved profitable in not only securing his coöperation, as already said, but also in doing away with constant measurement and reference to detail drawings, thereby conserving time and reducing cost.

Skintled Brickwork. This type of wall has possibilities for a wide variety of effects, two of which are shown in these illustrations (Figs. 8 and 9, and Figs. 10 and 11). In the first the face is laid in common bond, and little if any effort is made to secure a uniform type of joint. The individual brick are set at irregular distances from the normal face of the wall, the projections varying from flush to plus ¾ inch and the recessed brick from flush to minus ½ inch. In the second illustration the effect is very different, only certain selected brick departing from the usual procedure of being laid "to the line." In this case the projections vary from flush to plus ⅝ inch, none of the brick being set back of the face. It might be noted that both of these examples of brickwork are in the same locality and built with the same kind of brick and mortar. The difference in texture was accomplished simply by using different types of skintling. Other variations may be obtained by neglecting to strike or tool the mortar joints and by allowing the excess bedding mortar squeezed out by "shoving" the brick to permanently remain adhering to the face of the wall.

It has been the custom for many years to set lines

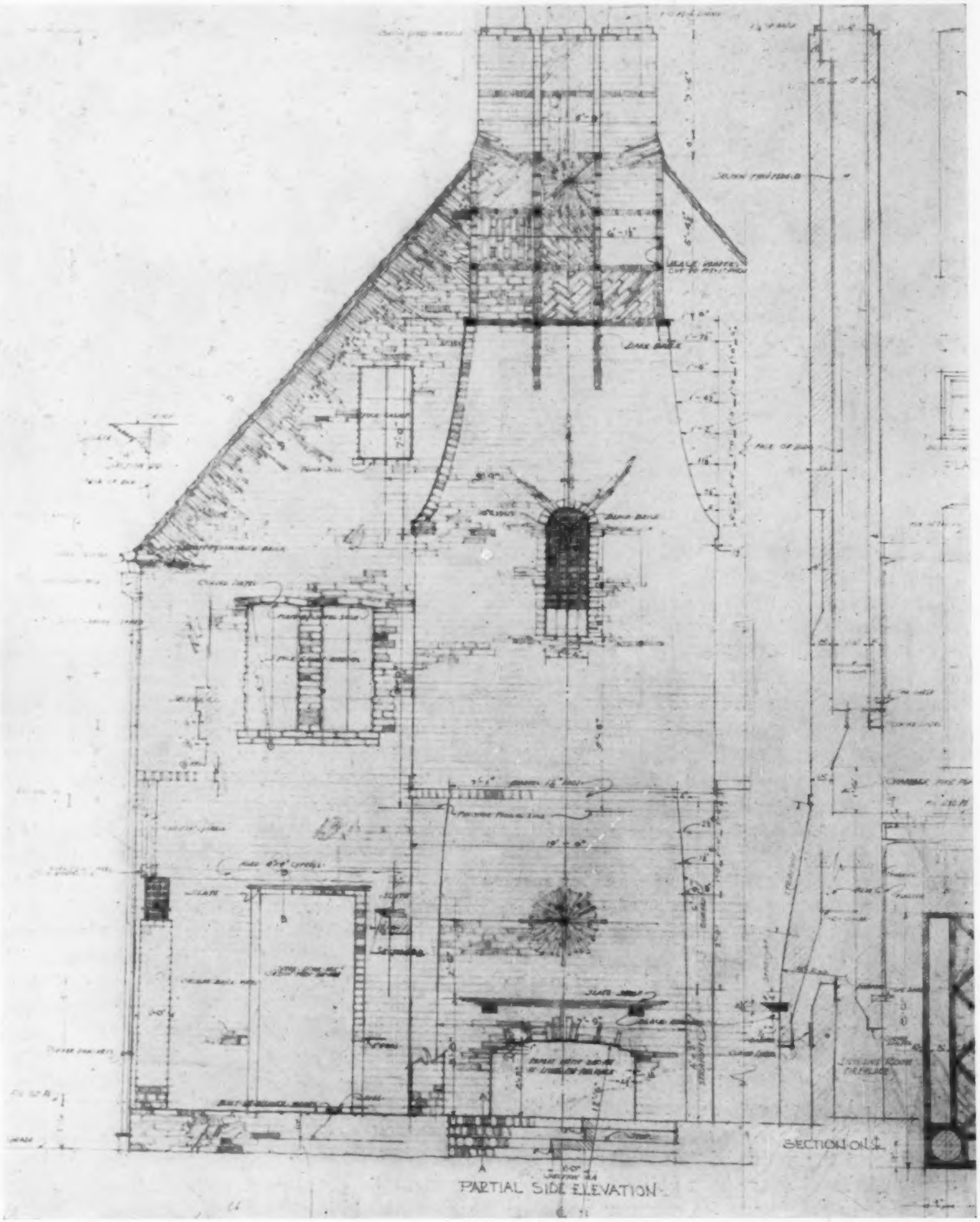


FIG. 6. DETAIL OF BRICKWORK SHOWN IN FIG. 7
JOHN T. BRIGGS, ARCHITECT

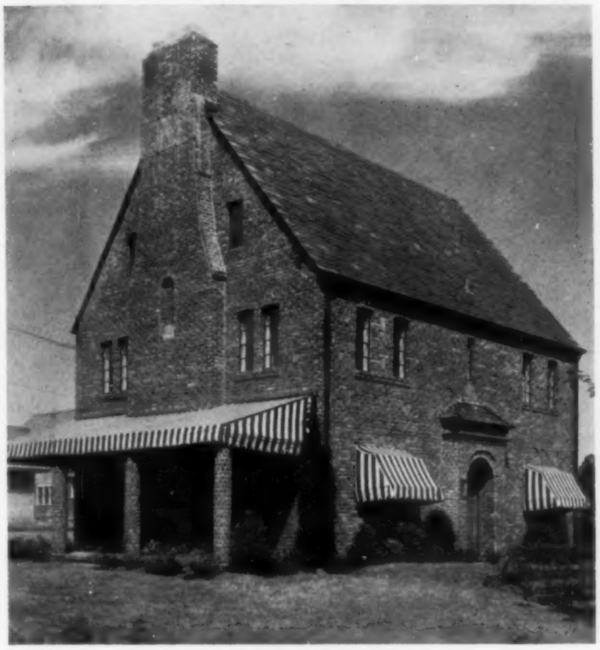


Fig. 7. Variety in Brick Texture
John T. Briggs, Architect

Fig. 8. Skintled Brickwork
S. S. Beman, Architect

for building brickwork with relation to the face of the wall and to make all measurements from this face line. If this method is followed and measurements made for individual brick in erecting skintled walls, the cost will be prohibitive. Lines for this type of wall should be placed at the back line of the wall, which is carried up plumb, and the facing brick set approximately as shown. Do not allow measurements for projections, etc., to be made except by eye. If this suggestion is faithfully followed, the cost of laying skintled walls will not be any greater than that for constructing what might be termed ordinary walls,—that is plumb, with level courses and joints struck one side.

Carved Brick. Such brickwork offers such a wide range of possibilities in connection with the decorative details of buildings that it could well be classed as something apart. The coöperation of architect and carver is, in many cases, closely indicated, and it may be that construction men or mason foremen could be of real assistance in suggesting practical ways of accomplishing desired results. One designed by the architect and executed by bricklayers, indicates some of the possibilities. It is built of the ordinary brick, those in the sails of the ship laid flat (4-inch side out) and the rest on edge, (Fig. 12). Joints were as indicated on the drawings. The carved head is simple, and was done with small chisels by the mason. The white water effect was secured by using a white cement mortar for the brickwork representing the waves under the bow of the ship. The mast, masthead decoration and pennant were of mortar. Both this and a companion figure, representing the stern of the ship, were part of the regular construction contract and were executed by bricklayers forming part of the contractor's regular organization.

Fig. 9. Detail of Brickwork Shown in Fig. 8

The examples shown here, illustrating modern work in design and brickwork, are naturally but an infinitesimal fraction of those existing. Probably the most convincing demonstration of the interest this material holds for present-day designers could be had by looking out of windows in the upper floors of the taller buildings in any city and noting the many examples of decorative brick detail in buildings erected in recent years. To one familiar with the trend of architecture in a given city, it is possible, by noting the materials used to secure decoration, to name with a fair degree of accuracy the date of construction. One man noted for the excellence of his brickwork recently remarked that if designers would devote

Fig. 10. Detail of Brickwork Shown in Fig. 11
Russell Walcott, Architect

Fig. 11. Skintled Brickwork
Russell Walcott, Architect

more careful and conscientious effort to brick detailing, the time would be well repaid, resulting in more artistic buildings and lower costs to clients.

A building now under construction in the Grand Central zone of New York is a forerunner of what we may expect to see in the yet-to-be-built commercial buildings of America. In this particular design the facade above the second floor presents the effect of a series of parallel vertical planes. These are emphasized not only by the varying depth of projections but by a selection for shade of the brick used. This results in one vertical plane providing a contrast by the use of darker brick, while the adjoining plane uses brick of a somewhat lighter shade.

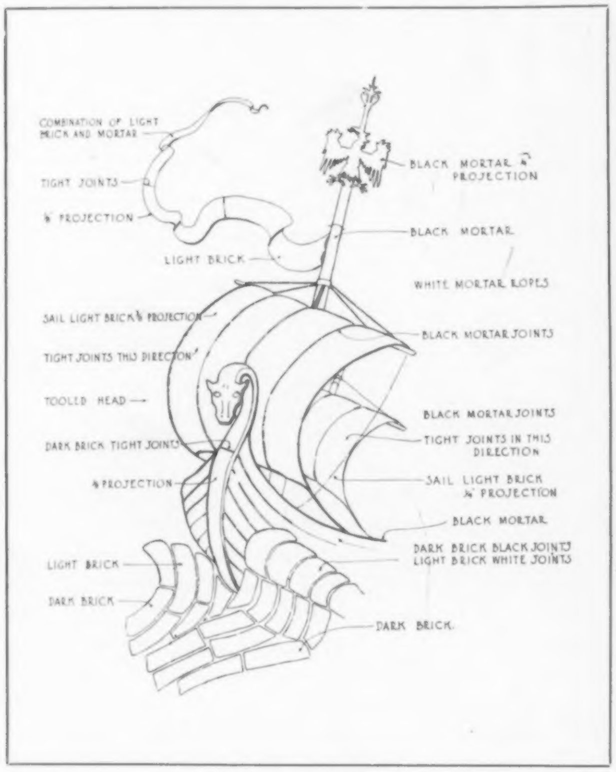


Fig. 12. Detail Used by Bricklayer in Executing Ship Design

Fig. 13. Ship Design, Simply Executed
John T. Briggs, Architect

√

BETTER STUCCO HOUSES

BY

ARTHUR C. ALVAREZ

ASSOCIATE PROFESSOR OF CIVIL ENGINEERING, UNIVERSITY OF CALIFORNIA

DURING the last decade use of the timber-framed stucco house has become established architecturally throughout the United States to a very wide extent. There are several very good reasons for the development of this type. It is comparatively low in first cost, and also in final cost, if correctly and carefully built. Architecturally and structurally it lends itself readily to the interpretation of a number of charming types of domestic architecture, notable among which are the English half-timbered cottage, the Spanish town house and farm house, the Italian villa, the Moorish house of north Africa, and the adobe pueblo structure of the southwest. By the incorporation of certain features in its structural design, at a comparatively slight additional expense, such a house may be made practically earthquake- and hurricane-proof. By their very nature, its exterior walls are fire-resistant to a considerable degree; and if care is taken with the stucco coating, its first cost will be its only cost; there should be no need of applying, later, paints or other preservative coatings in order to render it leakproof.

Because of its many desirable features, the demand for this type of house will increase to an amazing extent. The invested capital which it represents, large as it is at present, will amount to an enormous sum. Therefore, any structural details that will add to its life, whether it be exposed to freezing atmosphere, excessive rain, fire, severe earthquakes or hurricanes, should be of vital interest to architects, home owners, insurance companies and bankers. It is the purpose of the writer to outline how present building practice may be improved, so as to make the timber-framed stucco house more resistant to the severer exposures, and longer lived under ordinary conditions. These remarks will apply only to dwellings from one to three stories in height. No attempt will be made, nor is it necessary, to set forth comprehensively and in detail, the complete structural plans and specifications for such a house; instead, critical requirements will be outlined and discussed under the headings: (1) Foundations; (2) Framing; (3) Chimneys; (4) Stucco Covering.; (5) Roof Covering. The present article will deal with foundation and framing; a subsequent article with the three remaining subjects. The very severe earthquakes that occurred in 1927 in the Crimea, and more recently in Bulgaria and Greece, remind us of the ever-present earthquake hazard. In the Bulgarian earthquake more than 100 persons were killed, and more than 600 injured. The complete ruin of more than 13,000 buildings left about 295,000 people homeless. In the vicinity of Yalta, in the Crimea, more than 75 per cent of the buildings were completely demolished. On an average, about 50 destructive earthquakes occur every year throughout the world, and their location is not limited to foreign countries. It therefore behooves wise and provident architects and investors to build accordingly.

Foundations; Essentials for Resistance to Earthquakes. The reliability of the foundation being of prime importance, it is the first matter that requires consideration. The term "natural foundation" will be used here to designate the character of the terrain in which the excavation is made for the concrete foundation. Types of natural foundation are sand, clay, gravel, sand and clay, sand and gravel, gravel and clay, loam, mud, and the various kinds of solid rock in place. Solid rock in place is of course the best natural foundation for a structure in a region subject to severe earthquakes, because solid rock vibrates only elastically during an earthquake, by which is meant that the rock does not usually suffer a permanent dislocation as a result of the shock. Furthermore, the amplitude of vibration or amount of the swaying of solid rock is less than for any of the looser materials. During severe earthquakes a building that rests on loose sand, alluvium or river bottom sediment, marsh, or deep recent fill, such as frequently occurs on building lots as a result of street grading operations, will be violently shaken and may be permanently dislocated. Even if the frame remains intact, much damage to plastering and brick chimneys is likely to occur unless special care be taken in the design of foundation and chimneys.

Of course, for well known and obvious reasons, the areas of the different parts of the concrete foundation in plan should always be carefully arranged by the architect so as to be proportional to the vertical loads distributed over them. This is particularly necessary for foundations in the looser soils, such as marsh and alluvium, so that unequal settlement of the building, as the result of a strong shock, will be minimized. In the majority of cases a natural foundation of solid rock does not occur on the site at a reasonable depth for the type of structure under consideration. A large number of the residences in many cities must be located on talus slopes, alluvium or made ground. In order to reduce the earthquake risk to a minimum, when building on hazardous natural foundations such as these, certain precautions should be taken:

1. The natural foundation should be kept as dry as possible by drainage, wherever that is feasible. The value of drainage in reducing the susceptibility

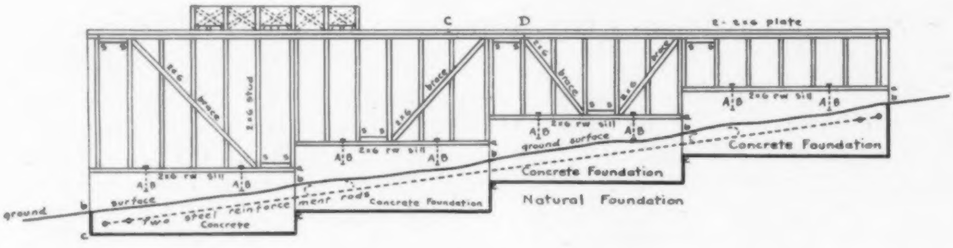


Fig. 1. Properly Braced Underpinning on Reinforced Stepped Foundation, with Anchor Bolts

of a soil to vibration is very great. The opportunity to drain a soft wet foundation for a house in a region of seismic disturbances should never be neglected.

2. The bearing pressure of the soil should be made very low; for example, one ton per square foot for foundations 3 feet and less in depth; one and one-half tons per square foot for foundations of more than 3 feet in depth. Since both the weight of this type of house and the magnitude of the loads applied within it are comparatively small, this requirement will not lead to excessive dimensions for the concrete foundation.

3. The foundation should be made deep. For example, assuming a flat alluvium site on which it is proposed to erect a residence of some size and cost, if the concrete foundation reaches to a depth of 6 or 8 feet in the alluvium, the building will be shaken much less violently than if the concrete goes down only 2 feet. Since in localities of soft clay it is necessary to place the base of the concrete foundation below the frost line, which, in the northern states ranges from 3 feet ordinarily to a maximum depth of 6 feet in extreme cases, this suggested depth of 6 or 8 feet, in order to reduce earthquake effects in treacherous regions, is not an excessive requirement. In order to gain the added bearing power that accrues from going to a greater depth with the concrete foundation in a soft natural foundation, the actual area on which the concrete bears must have its lateral support balanced, either by material superimposed to the same height on each side, as shown in Fig. 5, or, if the entire basement is excavated, by a reinforced concrete floor capable of resisting the conjugate upward pressure necessary for such lateral support, as in Fig. 6. The greater the bearing power of a natural foundation, the less disturbance will it suffer during an earthquake. For this reason, depth of concrete is desirable for a foundation in soft material. Where the depths differ on two sides of a concrete foundation, as in Fig. 7, the smaller of the two depths determines the bearing power.

4. The concrete foundation should be reinforced with some steel rods placed longitudinally. By thus enabling the concrete to bridge any soft spots in the natural foundation, this will tend to prevent unequal settlement, with its consequent damage to plastering. Such reinforcement serves also the important function of tying together the different parts of the concrete foundation, and would thus prevent the lower ends of the underpinning from spreading if the concrete should crack. The least amount of such steel for the shallowest proper depth of concrete is two ⅝-inch corrugated rods, one placed 3 inches below the top surface of the concrete, the other the same distance above the base, since at different cross sections of the concrete longitudinal tension, due to unequal settlement, is as likely to occur at the top as at the base. For a concrete foundation ranging from 4 to 8 feet in depth, there should be two ¾-inch steel rods near the top, and two near the bottom. The rods should be overlapped at least 2 feet; their ends should be hooked into 180-degree bends, 6 inches in diameter. The overlap should not be placed at the corners of the foundation, but the rods should be bent around the corners of the foundation so that approximately the middle of the length of the rod is at the corner.

5. To prevent sliding during an earthquake, the excavation of the natural foundation should be stepped wherever the site is sloped, as illustrated in Fig. 1; the excavation should not be sloped as shown in Fig. 2. Another particularly precarious type of natural foundation is deep clay on a steep hillside watersoaked with seepage. Complete under-drainage and deep stepping are absolutely essential, because numerous are the instances in which houses on such foundations have slid, even in the absence of earthquakes.

Fig. 1 illustrates the minimum concrete foundation requirements for an earthquake-resisting two-story house located on a well drained compact sand-and-gravel natural foundation in a region where

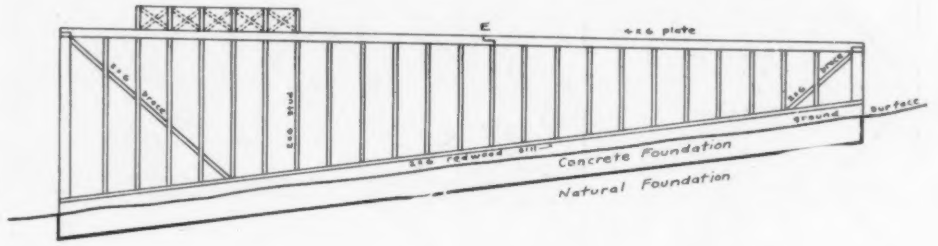


Fig. 2. Poorly Braced Underpinning on Sloping Foundation, without Anchor Bolts

neither freezing temperature nor hurricanes are likely to occur. To prevent decay of sill and base of underpinning, the vertical distance, *ab*, should be made a minimum of 8 inches; *bc* should be a minimum of 15 inches. If the natural foundation is clay or adobe, whether slightly sloped or level, it should be drained by surface trenching and sub-surface tiling, and *bc* should be between 24 and 36 inches, so that the base of the concrete will rest on a material of nearly constant moisture content. Depth here is important, because changes in moisture content of clay and adobe soils produce such large expansion and contraction, with consequent heaving of the building, that the plastering may be badly cracked. The permanence of a good stucco coating depends on the immovability of its backing.

Where a large amount of concrete will be required for the foundation, the architect should procure samples of the available local sands and crushed rock or gravels, and determine what mixture will give the most economical concrete that has the required strength and water-tightness. The best practice in this regard may be found outlined in a number of publications: (1) "Design and Control of Concrete Mixtures," published by the Portland Cement Association; (2) *Proceedings of the American Society of Civil Engineers,* October, 1924. Where only a small amount of concrete is involved, less precision may be used in proportioning the ingredients. Each cubic yard of set concrete should contain at least five bags of Portland cement. The least amount of mixing water should be used, consistent with ease of tamping the concrete in the forms. The sand and coarse aggregate, whether it be crushed rock or river gravel, should be hard, clean, well graded in sizes, and free from dust, clay or loam. Before adding the cement, these should be mixed thoroughly dry in the proportion of 1 of sand with about 2 of coarse aggregate, as measured by volume loose. The set concrete should be kept moist for at least one week after pouring.

At intervals of about 4 feet, ¾-inch bolts, 12 inches long, should be imbedded vertically in the concrete foundation, as shown at *AB* in Figs. 1 and 4, to provide for anchorage of the sills, which should be drilled to engage these bolts, and tightly bolted with nuts and washers. This anchorage is required because in many instances frame houses have been shifted laterally from the top of horizontal concrete foundations where the sills were not so anchored. In addition to anchorage by bolts, the sill should be kept from sliding longitudinally along the top of the concrete by having alternate short lengths of sill of, for example, 4- or 6-foot lengths, depressed into the concrete for a depth of about 6 inches, as shown in Fig. 4. It is very inexpensive to pour in the concrete to these different levels. If this is done on all sides of the building, and if the concrete foundation has been reinforced, as was previously recommended, sliding of the superstructure from the concrete foundation cannot occur. The non-sliding advantage of a sill, thus bolted and depressed at intervals in the concrete foundation, is assured only if the concrete foundation is reinforced with steel rods. Obviously, the frame of the house should be as securely anchored to the sill as the sill has been anchored to the concrete foundation, the sill thus serving as the structural connecting link between frame and foundation. This can be accomplished most effectively by the use of diagonal sheathing, because "toe-nailing" of underpinning to sill, as commonly practiced, is of doubtful structural value. In order to have ample nailing area, between diagonal sheathing and sill, the sill should be 3 inches thick by 6 inches wide, when the house is taller than one story. A 2 by 6-inch sill is sufficient for a one-story house.

If the basement space is not devoted to any type of occupancy, 2 by 6-inch timber corner crossties at all corners of the foundation, nailed against the top face of the sill, also against the bottom face of the plate or cap of the underpinning, will add greatly to the tenacity and rigidity of the building as a struc-

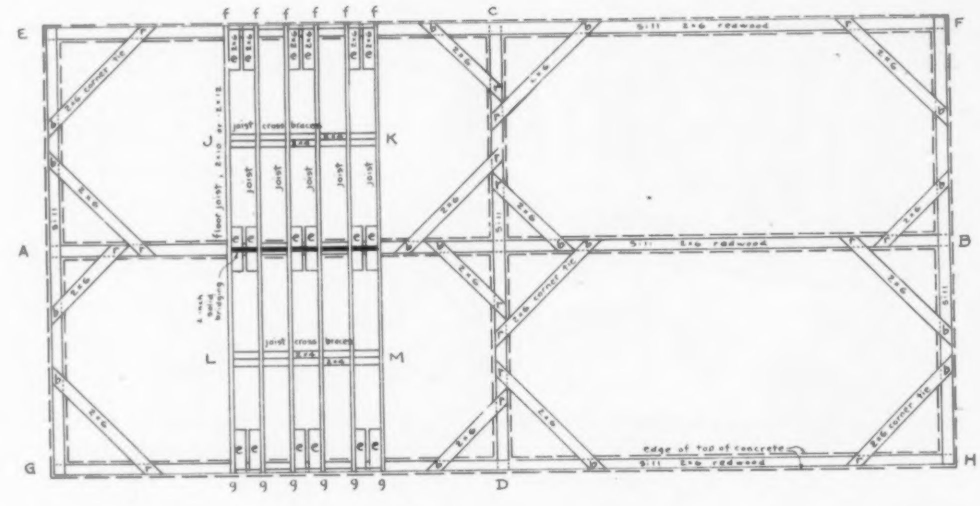


Fig. 3. Corner Ties for Sill and Plate Underpinning. Method of Attaching and Bracing Floor Joists

ture. Such timber corner crossties are illustrated in Fig. 3. To make them efficient, at least five 20-penny spikes should be driven at each joint to sill or cap. The crossties must first be drilled to receive these large nails, as otherwise they will be split, and thus practically worthless for the purpose intended.

Foundations; Essentials for Resistance to Hurricanes. It has been estimated that the maximum velocity of the wind in both the Florida hurricane of September 18, 1926, and the Cuban hurricane of October 20, 1926, was about 125 miles per hour. For safety in storms of this magnitude, buildings should be designed for a wind pressure of 30 pounds per square foot of flat vertical surface exposed; a design pressure of 20 pounds per square foot is too small. This was one of the definite conclusions reached as a result of the examinations made after these storms. In an earthquake, other factors being the same, the horizontal force exerted by a building on its foundations depends on the dead weight of the structure. The heavier the structure, the greater is this horizontal force. Because of its comparatively light weight, the timber-framed stucco house has a great advantage over a brick house in this regard. But in a heavy wind, the horizontal force exerted by a building on its foundation depends on the surface area exposed to the wind. Therefore, because of the light weight of its superstructure, the foundation of a timber-framed stucco house exposed to hurricanes must be made heavy enough to anchor the building against both sliding and overturning. To reduce the tendency to overturn, tall and narrow buildings should be avoided. Where the natural foundation is good, a minimum depth of 30 inches is recommended for the concrete foundation of a one-story house where severe hurricanes occur. This should be increased to 48 inches for a three-story structure. Furthermore, there should be incorporated all the details previously described as desirable in foundations for resistance to severe earthquakes, such as: (1) drainage of natural foundation, (2) stepping of excavation in natural foundation, (3) bolting of sill to concrete, (4) reinforcement of concrete, (5) depression of alternate short lengths of sill in concrete.

Framing Essentials for Resistance to Earthquake and Hurricanes. Some of the structural features required in the framing of a building for resistance to earthquakes are the same as for resistance to hurricanes. There must be a structural frame. All parts of the frame must be securely tied together. The frame must be very rigidly braced against horizontal thrusts in every direction. In addition, for resistance to hurricanes, the wind must be kept out of the building. This means that special protection must be provided for all openings, and that both the integrity and anchorage of exterior walls and roof must be assured. The tying and bracing of the parts of the frame are so important that particular attention should be paid to the structural details that are most effective for this purpose. Methods that should be employed will now be outlined under the headings: Underpinning, Floors, Exterior Walls, Roof. Several of these topics will be considered later.

Underpinning. In buildings of the limited height under discussion here, the bracing of the underpinning is of vital importance. There may be very serious effects of the collapse of the underpinning during a severe earthquake, because of inadequate bracing. It is of equal importance that the top of

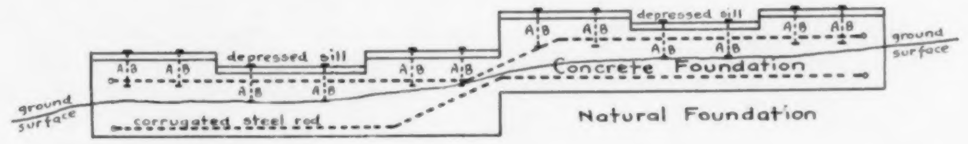


Fig. 4. Sill Depressed in Segments to Prevent Sliding

the concrete foundation be sufficiently high above the ground surface, so that the bracing of the underpinning, originally sufficient, does not become ineffective in time because of decay, due, for example, to gophers' piling up earth against the bracing. The sill should be of decay-resisting timber, such as redwood or red cedar.

For a one-story house, the underpinning should consist of 2 by 4-inch pine or fir studs placed 16 inches center to center; the underpinning of two- or three-story buildings should be 2 by 6-inch studs at the same spacing. All diagonal braces should be of the same sizes as the studs. The diagonal braces should be arranged as shown in Fig. 1, rather than as shown in Fig. 2, which illustrates common practice. The increase in rigidity, thus obtainable at a trifling increase in cost of labor, is very great, as analysis will show. In Fig. 1, note that the diagonal braces are continuous rather than broken between studs, as in Fig. 2; that their ends are double-mitered to blunter angles, which makes these ends stronger in compression than the ends of the braces in Fig. 1, which are only single-mitered; and that there are timber stays, marked as in Fig. 1, of stud size, which can be made very easily and effectively to take up the compressive stresses in the diagonal braces. The stays should be wedged with driving fit between the studs and should be attached to plate and to sill with ten 20-penny nails in each stay. The stays must be drilled to receive these large nails since, otherwise, if they are split by the nailing, their resistance is practically nullified. Assuming the common practice of using three 12-penny nails at each joint of the diagonal braces in Fig. 2, the underpinning, as braced in Fig. 1, can withstand a horizontal earthquake thrust at the level of the plate, that is ten times the safe similar thrust for the underpinning, as braced in Fig. 2. The underpinning of each side of the house should have at least two diagonal braces sloping in each direction, as shown in Fig. 1. The plate of the underpinning should be double, so that long splices, such as *CD*, will permit of sufficient nailing to produce tensile continuity in the plate. With continuity in the plate, the diagonal braces may be placed wherever the absence of openings permits, but preferably not at the ends of the wall, as in Fig. 2. A single-piece plate, spliced as at *E* in Fig. 2, is practically devoid of continuity in tension. Where a building is very long in plan, a transverse foundation, such as *CD* in Fig. 3, supporting a line of braced underpinning, is very advantageous to prevent bulging of the exterior walls at *C* and *D*, due to horizontal thrusts of hurricane or earthquake origin, as it is an efficient reinforcement.

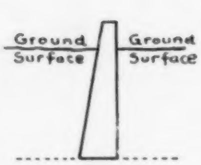


Fig. 5

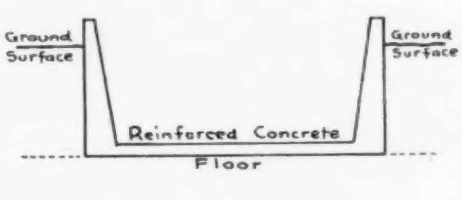


Fig. 6

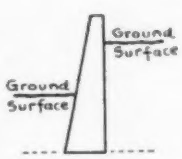


Fig. 7

THE STRUCTURE OF INDOOR TENNIS COURTS

BY

FRANK W. SKINNER
CONSULTING ENGINEER

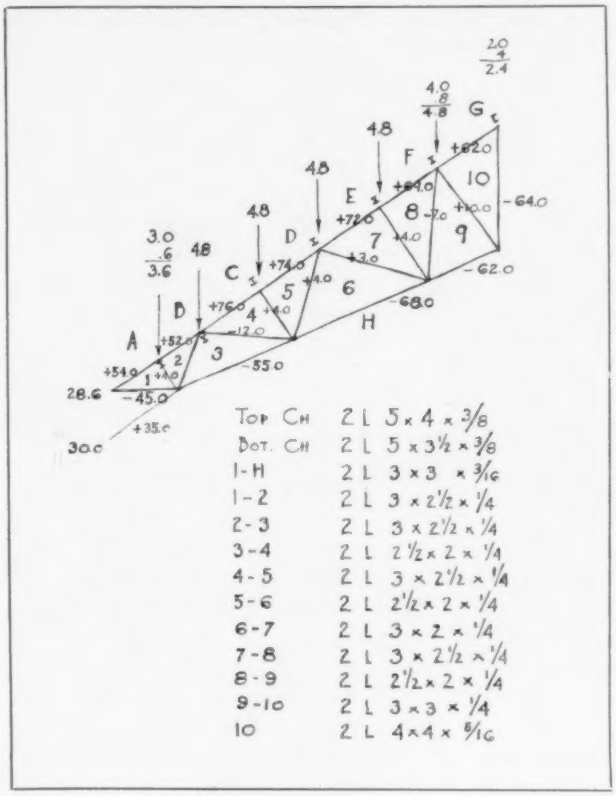
SINCE about 1900 a new type of structure has been developed to meet the requirements of complete shelter and protection for full-sized tennis courts, more than a score of which have been built and others planned for country estates and at high class pleasure resorts,—many on or near the Atlantic coast from Florida to Montauk Point. They have become much more elaborate and complete than mere roofs and walls enclosing playing spaces with ample clearance for full-scale operations. Besides affording commodious arenas for players and spectators, they often provide, usually in wings or extensions, lounges, dressing and toilet rooms, shower baths and other conveniences, and frequently swimming pools, making altogether complete equipments, involving expenditures that may reach from a minimum of about $80,000 to several times that amount.

The essential requirements for all tennis court buildings are an unobstructed, fully enclosed and well lighted area about 50 feet in height by a minimum of about 60 by 120 feet for a 36 by 78-foot standard court with a satisfactory, durable, level playing floor, and reliable first class heating and ventilating systems. As a tennis court is essentially a luxury, usually provided for the pleasure of wealthy owners and their friends and not required to produce financial returns or be limited by strictly economic considerations, it follows that the style, arrangement, equipment and details vary widely with the taste and fancy of the owner, local conditions and the personality of the architect, thus not only permitting but insuring wide variations of construction and equipment, so that no specific types of framing, plan, dimensions or equipment have been generally adopted. Each new building is generally of a new and distinct design. Generally, the longitudinal axis of the building is east and west, dressing rooms are on the north side, wall illumination on the south side, and skylights are in the roof above the whole playing area, those with a southern exposure generally being painted or whitewashed to prevent excessive glare. Owing to the considerable roof span required and the corresponding length of longitudinal bays, it is difficult to construct a satisfactory wooden framework with the usual truss forms, and even if one were built, the weight and fire hazard would be excessive; the bulk would be a serious obstruction to light and would be likely to give a heavy, clumsy effect. The newer form of truss that is a segmental arch made up of a network of short lengths of wood and having steel tie-rods to take the thrust, might be adopted. Such a roof structure was employed at Houston to house the recent Democratic Convention. However, the tie-rods might interfere with the playing, and the problem of skylighting would be serious. The latter problem might be eliminated if clerestory lighting were employed.

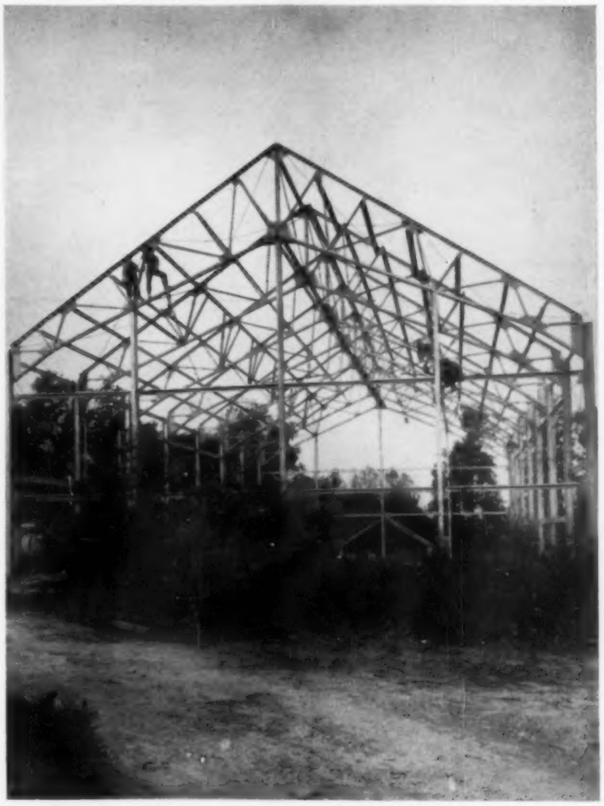
One of the covered tennis courts was designed by Warren & Wetmore for Harry Payne Whitney. It has high and heavy reinforced concrete walls, which on all sides are integral at the top with the lower part of the pitched roof which forms an eccentric cantilever structure enclosing an open rectangular space over the court and supporting there a double-pitched large skylight. Recently, from designs by the same architects, there has been built for Marshall Field a steel-framed tennis court building with eight transverse bents having their tall vertical posts in the side walls integral with the pitched rafters, both of plate girder construction; and the rafters of each pair are connected about midway between the eaves and the apex by adjustable horizontal tie-rods. The transverse bents are braced by light longitudinal wall and roof struts and trusses. This type provides rigid construction with riveted or bolted joints throughout, and is suggestive of church types.

Delano & Aldrich have designed some of the recently built structural steel tennis courts for Henry Rogers Winthrop, Jr., for Harrison Williams, and for John T. Pratt, all of different types, and two of them have attached swimming pools. Mr. Winthrop's tennis court at Woodbury, N. Y., is about 130 feet long, 51 feet high and 67 feet wide over all, exclusive of the porch, 16 feet wide, on the south side. The steel framework weighed about 100 tons. There are eight transverse bents with vertical I-beam columns having deep riveted connections to the end vertical web angles of the light riveted pitched roof trusses, all of the members of which are pairs of angles with 2 to 5-inch flanges, and gusset plate connections. At the top chord panel points there are 12 lines of 7-inch I-beam purlins besides 7-inch channel purlins at eaves and ridge. The end and center panels between roof trusses and the end panels in all four walls are X-braced with 1-inch round diagonal rods; the side wall framing consists of horizontal and vertical channels, and there are horizontal channels and three intermediate columns in the end walls. Over the court there is a double-pitched 50 by 90-foot copper skylight, and the remainder of the roof surface is shingled, as are the walls. The shingles are laid on tar paper covering ⅞-inch matched wall boarding, nailed to 6-inch wooden studs covered on the inside with ½-inch insulation. The window sills are 9 feet above the grade of the court, and the steel sash are horizontally pivoted and are operated by vertical rods and gears. Radiators are set on the walls just above the tops of the foundation walls, 3 feet above the floor.

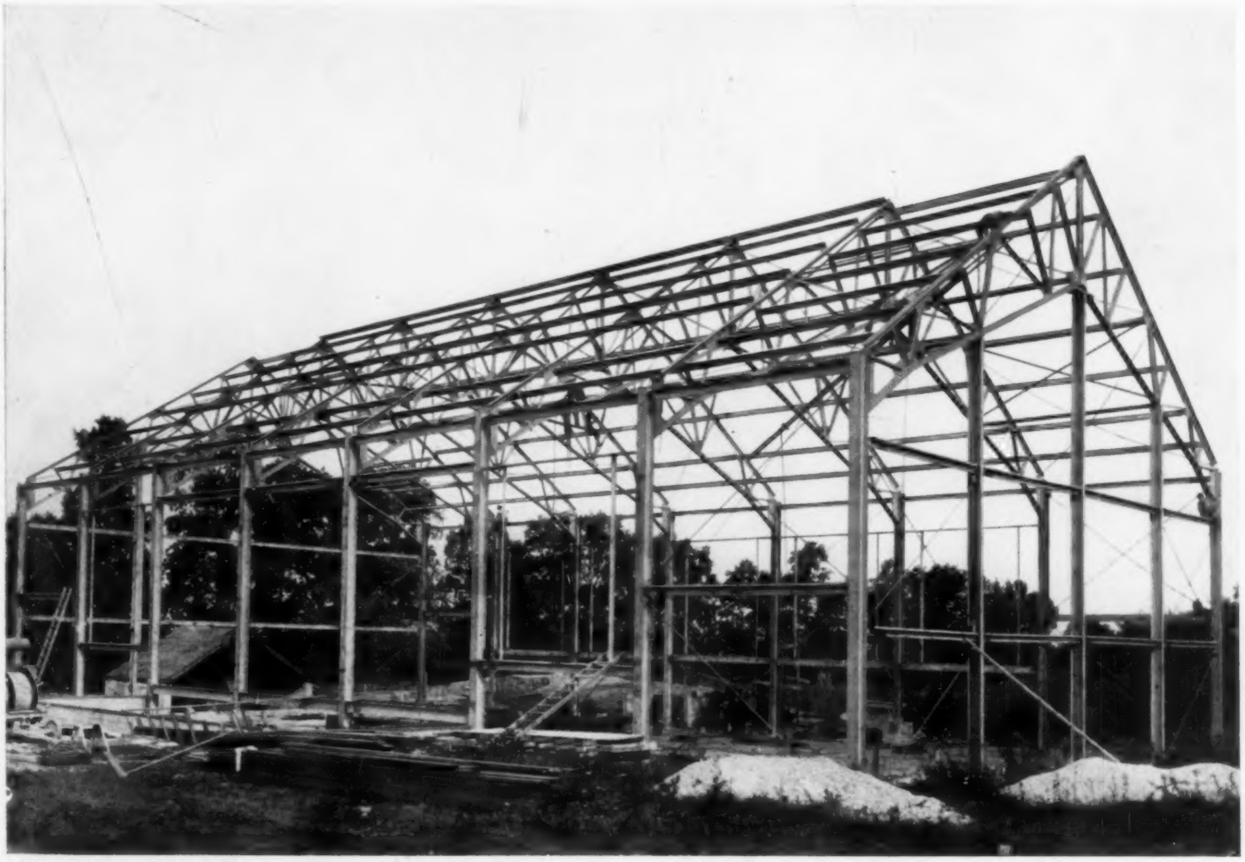
Considerable study has been given to securing the



TRUSS DIAGRAM



END VIEW OF STEEL FRAME



Photos, Albert Rothschild

STEEL FRAME FOR INDOOR TENNIS COURT OF HENRY ROGERS WINTHROP, JR., ESQ.

DELANO & ALDRICH, ARCHITECTS

View of Framework

most attractive and satisfactory type of framing and roof construction for the main court buildings, and efforts have been made to adapt important features of greenhouse and hangar construction that apparently meet some of the conditions demanded in tennis courts, but they vary so greatly in dimensions that they afford little direct precedent. It has proved difficult to modify the greenhouse types and details for the much larger dimensions of the courts, while the hangar trusses have been found much too deep, and to occupy too much space for the courts. Strength, minimum obstruction to light and interior space and a light, graceful effect are desiderata that were secured to a large degree in the design for Mr. Williams' court at Bayville, N. Y. The 72 by 130-foot court building, 50 feet high, has a 230-ton structural steel framework with eight main transverse Gothic arch bents of plate girder construction. The hingeless arch ribs are 3 feet deep at the base where they have horizontal flanges anchor-bolted to concrete piers. Each semi-arch rib is shop-riveted in two sections, tapered to a depth of about 20 inches at the crown, where and at the haunches, there are field riveted splices. The springing line is 8½ feet above the base, and up to this level the ends of the ribs are vertical with parallel flanges, made as are the curved portions with four 6 by 6-inch X-flange angles and ½-inch web plates. The end panels between arch ribs are X-braced with 1-inch round

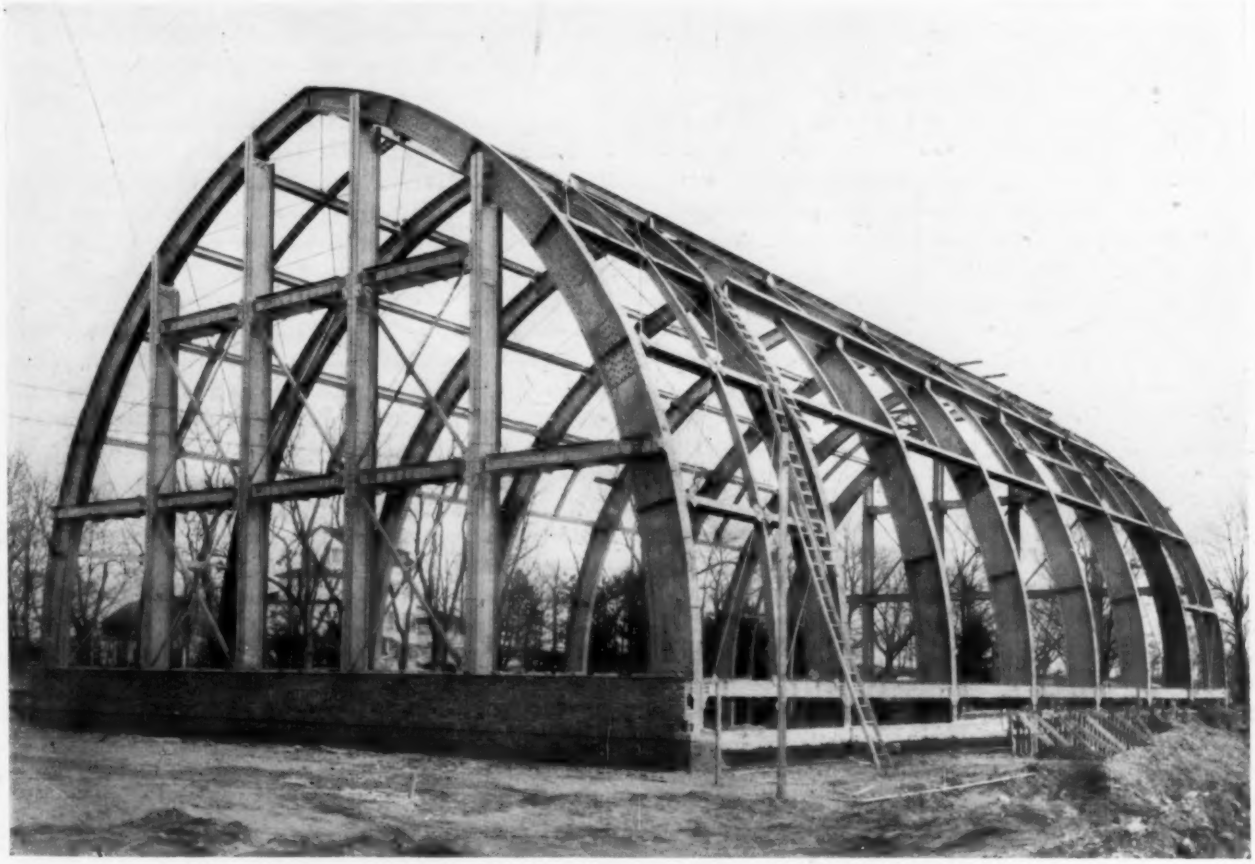
Steel Frame of Indoor Tennis Court on the Estate of Marshall Field, Esq., Huntington, N. Y.

Warren & Wetmore, Architects; Office of John Russell Pope, Consulting Architects.

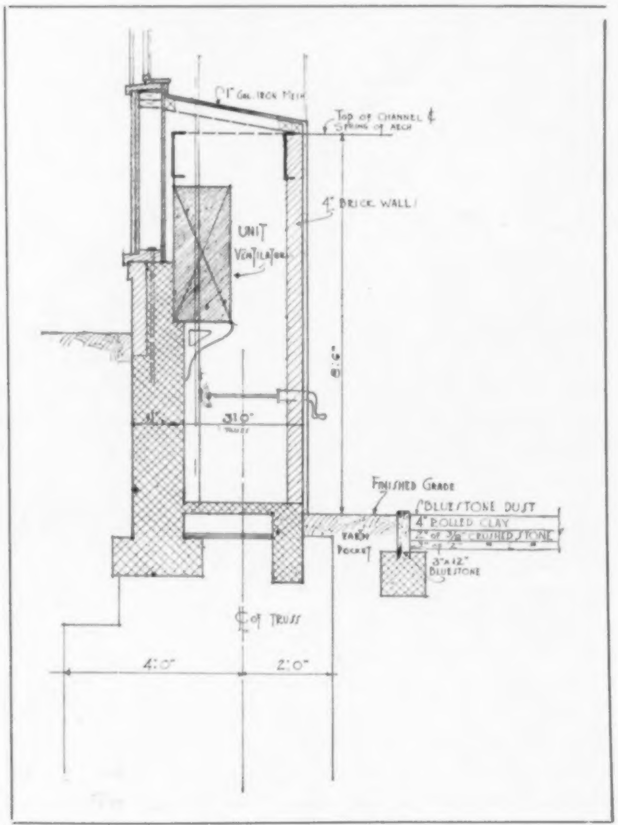
diagonal rods. Each end wall has four intermediate columns with I-shape cross sections, and is X-braced with 3½ by 3½-inch angles in the three center panels. In each side wall there is a double line of horizontal longitudinal channels at the spring line, and above them are 11 lines of longitudinal I-beam purlins, flush with the outer flanges of the arch ribs, provided with nailing strips to receive the 3-inch splined, dressed planks that are slated to form the roof and side walls.

In the center of the roof there is a copper skylight, about 52 feet wide; a wooden lattice with 2½-inch diamond mesh is set about midway between the inner and outer flanges of the arch ribs, concealing the purlins and reducing the apparent exposed depth of the ribs, giving them a slender appearance. The lattice and steelwork are painted in contrasting colors. The thoroughly rolled clay floor has a broken stone foundation and a bluestone dust finish and is enclosed by a bluestone curb. In two of the north side wall bays there are 14 by 14-foot windows with horizontally pivoted steel sash operated by miter gears and rods. Artificial illumination is provided by about 50,000 kw. of 200-watt white lamps and reflectors set in a continuous trough at eaves level, beside which additional lamps light the roof spaces, all controlled by a solenoid switch by which they can all be simultaneously turned on or off. Modulated steam heating units, each with an independent electric blower, are installed along the walls under the

End View of Framework



Steel Structure for Indoor Tennis Court of Harrison Williams, Esq., Bayville, N. Y.
Delano & Aldrich, Architects

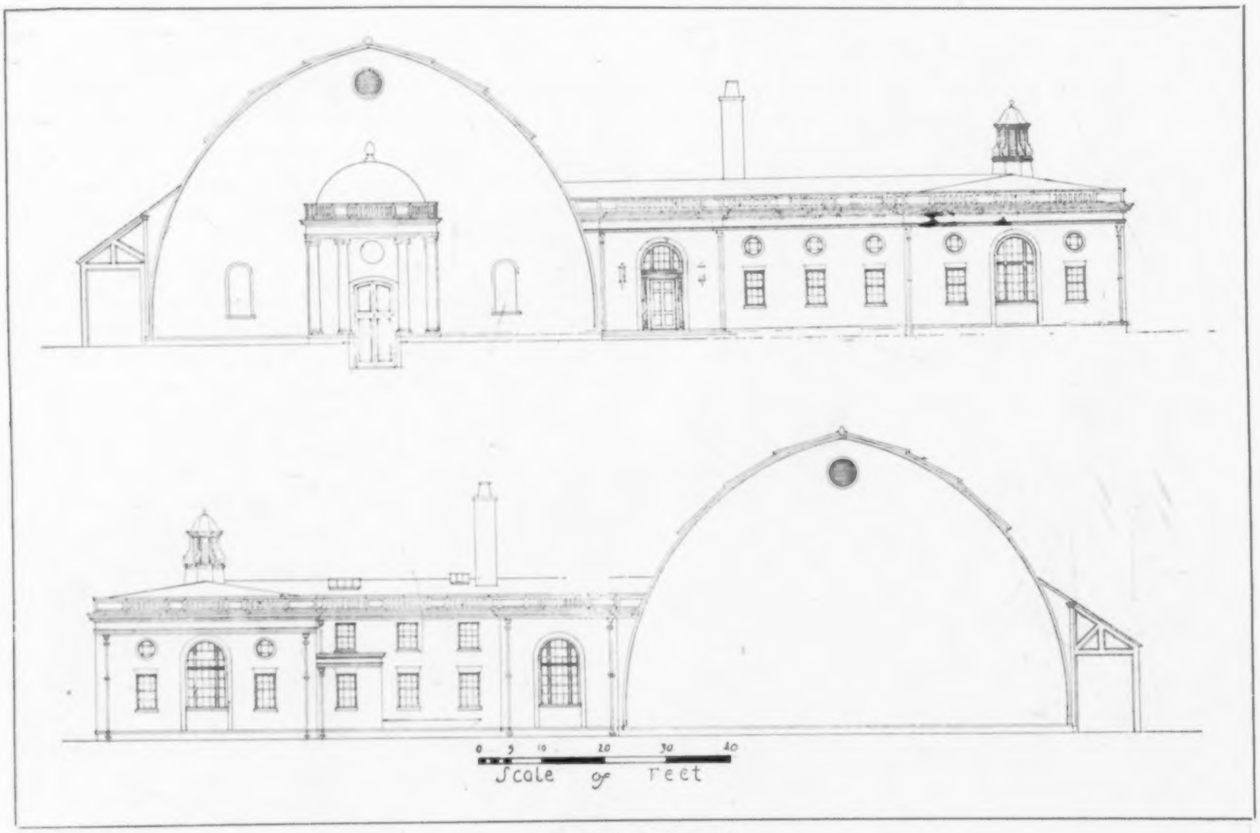


Section Showing Details

high window sills, and are enclosed by an inside brick curtain wall. Between the roof planking and the interior lattice work there is a layer of waterproof paper and another layer of chemically treated hair felt. On the north side of the court there is a 90 by 85-foot two-story extension containing lounge, kitchen, dressing rooms, baths and a 20 by 49-foot tiled salt water swimming pool with complete pumping, heating and filtering apparatus.

The steel frameworks for both the Winthrop and Williams tennis courts were erected in about two weeks each by a foreman and five men, using a guyed steel derrick with 65-foot boom and pneumatic riveting hammers operated by air from a portable gasolene compressor. Since the erection of these buildings, the company that fabricated and erected the steelwork has nearly completed the erection of another tennis court, very similar to the Williams court, for Mrs. H. P. Davison, and in the latter work has handled the structural steel with the 50-foot, 5-ton boom of a crane truck.

The most recent advance in indoor tennis court construction is explained by Gavin Hadden, C. E., in *American Lawn Tennis*, May 20, 1928. In his design the trusses arch the court longitudinally, giving a maximum headroom, at the net line, and come down to anchorages well back of the base lines; a most logical arrangement. The arc of the truss is similar to the arc of the tennis ball's flight.



East and West Elevations

Tennis Court of Harrison Williams, Esq., Bayville, N. Y.

Delano & Aldrich, Architects

HEATING AND VENTILATING FOR ARCHITECTS
ARTICLE IV

BY
PERRY WEST
CONSULTING ENGINEER

IT is not the details of the different kinds of heating and ventilating systems and apparatus with which the architect is primarily concerned. Rather it is with the broader principles and the general scheme of a system which will best fit the particular project which he has in hand. For this reason it is generally better if the architect's genius is employed on a visualization of the general scheme rather than on the making of a plan around some particular kind of system or apparatus. Most experienced architects realize that there is a general weakness toward preconceived ideas that certain kinds of systems and apparatus are necessary, and that these are the important factors in success; for example,—that a certain kind of boiler, pump, fan or heater, or that a vapor system, a vacuum system, a fan system or a split system is the all-important factor. It should be remembered that there are many different kinds of systems and apparatus which may be used with equal success, provided the design and installation of the equipment are proper, and provided also that their care and operation are commensurate with the service which they are intended to render. There are many features and not a few details of every mechanical equipment in which the architect is vitally interested, and it is with these features and details that we shall deal here rather than with those in which the designing engineer is particularly interested. There are certain items of mechanical equipment,—such as kitchen equipment, laundry equipment, hospital equipment and refrigeration which are not, strictly speaking, heating and ventilating items, but which are usually handled with the heating and ventilating equipment. The general features of these will be included.

The personal factors must be taken into full consideration in connection with each installation. The first of these are the owner's preferences and connections, as well as his ideas of the character and quality of the service. The owner must be educated away from as many of his superficial and impractical ideas as possible. Another personal factor enters into the operation and care of the equipment. There should be a definite planning for this by either installing such simple apparatus as may be properly taken care of by the most incompetent attendants likely to be employed, or by arranging for more competent attention to more complicated equipment, either by the owner's employes or through some outside organization. This is perhaps the most important item of the personal problem, as there are more failures of mechanical equipment due to improper care and operation than from any other one cause. Especially is this true of the equipment in schools, hospitals and public or semi-public buildings if they are not under carefully supervised operating departments. All of these primary problems should be solved at the inception of the project. The requirements as to space for apparatus, chimneys, ducts, flues, pipe spaces, etc., should be worked out during the sketching stages and not after the plans are so far advanced that necessary and possible changes cannot be made. This is most important. Lack of proper space and arrangement are responsible for more failures than any other one cause outside of improper care and operation.

Turning now to the different kinds of building projects and the particular features of their equipment with which the architect is vitally concerned, we shall endeavor to cover these briefly. For the more general discussion of the different kinds of heating and ventilating systems, together with their advantages and disadvantages, relative costs and space requirements, the reader may refer to the author's articles in the April and June, 1928 issues of THE ARCHITECTURAL FORUM.

Residence Heating Apparatus. Because of the small size of the average residence operation and the general practice of not employing special expert advice on the heating, a great many of these plants are an annoyance to their owners. There is generally at least one defect in every otherwise satisfactory system, such as an improper chimney, inefficient radiation in one or more of the important rooms, improper air elimination, improper sizes or grading of pipes, too small a boiler or improper location and connection of the apparatus, which necessitates continual attention and the carrying of excessive pressures to overcome the difficulties. It is unfortunate that these conditions exist in so many of our houses where such avoidable annoyances should be eliminated, and where they may be avoided, by giving proper study and thought to the planning. It is impossible to lay down rules here for the complete elimination of these difficulties, but the architect should see that the points now to be taken up are properly taken care of by some one who is competent. The chimney should be of the proper height and size, should be so located as to be as near as possible to a proper location for the boiler and so as not to be interfered with by back drafts from air disturbances caused by adjacent roofs or buildings.

Boilers and Furnaces. The boiler or furnace should be of ample capacity but not so large as to operate inefficiently on the average winter loads. It should be located as near to the center of the load as possible, and be convenient for coal and ash handling. When feasible it should be near the exposed

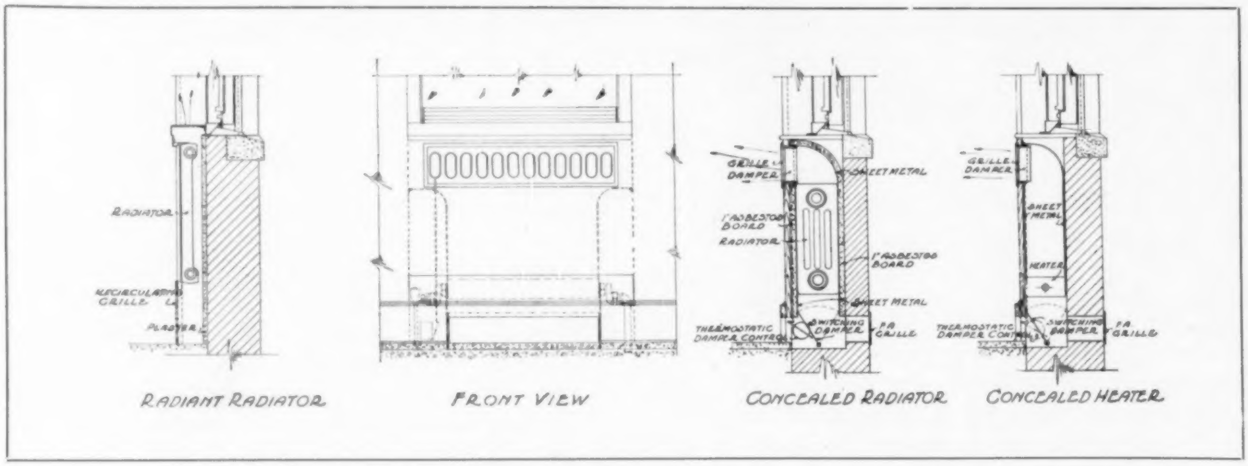


Fig. 1. Sections of Radiant Radiator, Concealed Radiator, and Concealed Heater

sides rather than the warmer sides of the building, and near the breakfast room, dining room, bathroom, living room or any other rooms requiring heat early in the morning or continuously rather than near bedrooms and other such rooms wherein the requirements are less exacting. Boilers for gas or oil should be specially designed for these fuels, as the ordinary coal-fired type of boiler will seldom prove efficient with fluid fuels. The piping should be balanced so that there will not be long runs to some parts of the building and short runs to other parts, since the long runs will require more pressure and longer time for circulation, as compared with the shorter runs. When long runs are unavoidable, separate lines should be used. One way of reducing uneven lengths of runs, in any steam or hot water system, is to run the supply and return mains parallel and with the flow in the same direction, so that the first radiator fed from the boiler is connected to the end of the return farthest from the boiler. This makes the combined length of the supply and return for each radiator practically equal.

Air Elimination. Proper air elimination is one of the most important requirements of any steam system. Securing the best automatic air valves or other automatic air eliminating apparatus is a good investment. Poor elimination of air is not only an annoyance in the matter of the time required for the heat to return to the radiators whenever the pressure is reduced and is again being raised, but is costly in the amount of fuel required to raise the extra pressure for driving the air out through the small apertures of usual air valves. The steam could be recirculated at much less pressure and with much less expenditure of fuel, but for the requirements of air elimination. The extra fuel for this may amount to as much as 20 per cent of the total fuel used, depending upon the regularity of operation.

The two-pipe open or vapor systems eliminate air most freely and are generally equipped with automatic devices for preventing the return of the air except through the slow leakage which is unavoidable in any system (through the joints and pores of the materials). Such systems operate over long periods, frequently at pressures below atmosphere, thus keeping the radiators filled with vapor as long as any appreciable heat remains in the boiler. The pressure must be raised, however, above atmosphere for certain periods, in order to eliminate such air as may leak into the system. One- and two-pipe closed steam systems must have air valves on the radiators and at the ends of basement mains. These valves should be of the best quality and may be of the non-return type for preventing the return of air to the system when once it is removed, somewhat as was just described. Although most of these non-return valves require slightly more pressure to operate than do the ordinary air valves, they are in operation for so much shorter periods that they are a convenient and economical adjunct to most systems. Open or vapor systems may be operated so that the condensation is always returned to the boiler by gravity, or they may be equipped with automatic apparatus for periodically returning the condensate by means of the steam pressure from the boiler. With the former arrangement, pressures above a few ounces are not permissible, as the water would be raised above the air outlet and either be discharged or close the outlet. With the latter arrangement, any pressure may be carried, and it is recommended for use in all except the smaller installations.

Radiators and Grilles. Radiators or warm air registers are recommended to be placed under or near windows, although there is some advantage in placing warm air registers on the inside walls so that the flues for them may be run in inside partitions, and be kept away from the cooling effect of the outside walls and from obstructing the window openings. The locating of the sources of heat under the window causes a mingling of the rising current of warm air with the falling current of cold air at this point. This offsets the chilling effect of the most severe exposure and at the same time produces the best diffusion of air in the room. The modern tendency is toward use of heating units designed to keep the

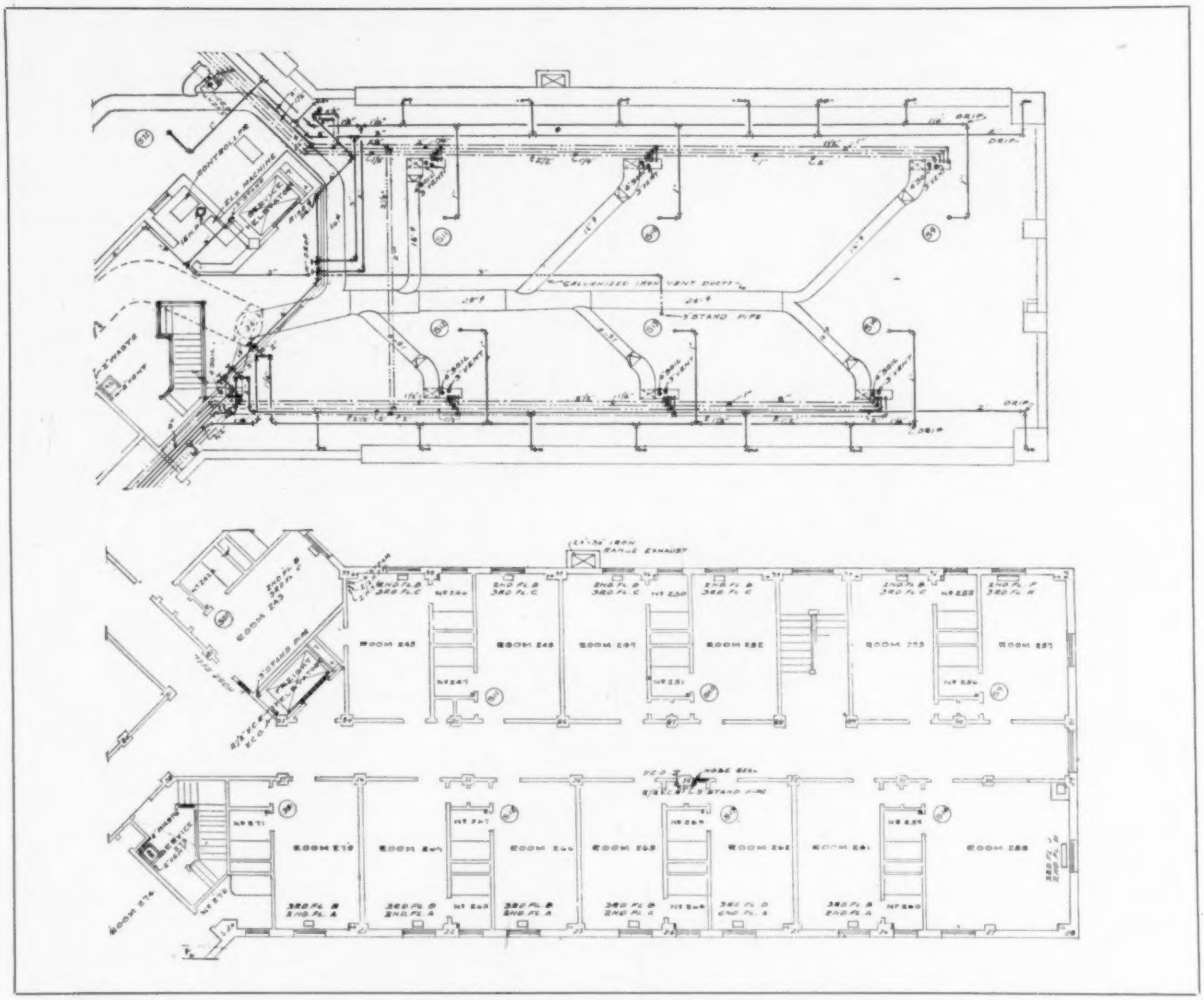


Fig. 2. Heating and Ventilating Layout for a Southern Hotel

heat from rising to the ceilings, thereby tending to equalize the temperature between floor and ceiling. This prevents unnecessary waste of heat by cutting down the losses through ceilings and upper parts of walls and makes for more comfort for the occupants, with less expenditure of fuel. Radiators designed for this purpose give off more of their heat by *radiation* and less by *convection* than do ordinary radiators. The concealed or cabinet type of heater may be used for the same purpose. These accomplish this by drawing the cold strata of air from the floor and replacing this air with warm air through a grille above, thus confining the circulation to a zone more or less between the floor and the height of the grille. Ordinary radiators may be used in the same way by installing them in scientifically designed cabinets or recesses with proper casings, grilles and dampers.

Fig. 1 shows a radiant type of radiator, a concealed heater and a concealed radiator arranged as was just described. Any of these may be used with or without fresh air connections from the outside. It should be noted that the control of the heat is by dampers controlling the volume of air passing over the radiator, and that no control valves are necessary on the steam or water connection. Valves may be included for use in case of repair or for long shutdowns if desired. The air control dampers may be automatically operated by self-contained thermostats located in the return air to each heater; this constitutes a splendid control system without pipes or auxiliary machinery. The fresh air connection may be from the outside or from a duct system supplied by a fan. In the latter case, air filters and humidifying apparatus may be used. In any case a switch damper is provided for varying the proportions of fresh and recirculated air. In case the fresh air is supplied from a fan, it assists the recirculation by an ejector action.

Residence Ventilating Apparatus. Ordinarily speaking, residences do not require much artificial ventilation. An exhaust fan for the kitchen, one for the laundry, and one for each toilet room are good adjuncts to any well appointed establishment. Ventilation may be provided for living rooms, dining rooms, reception rooms, ball rooms, etc. by means of the concealed heaters referred to or by a warm air fur-

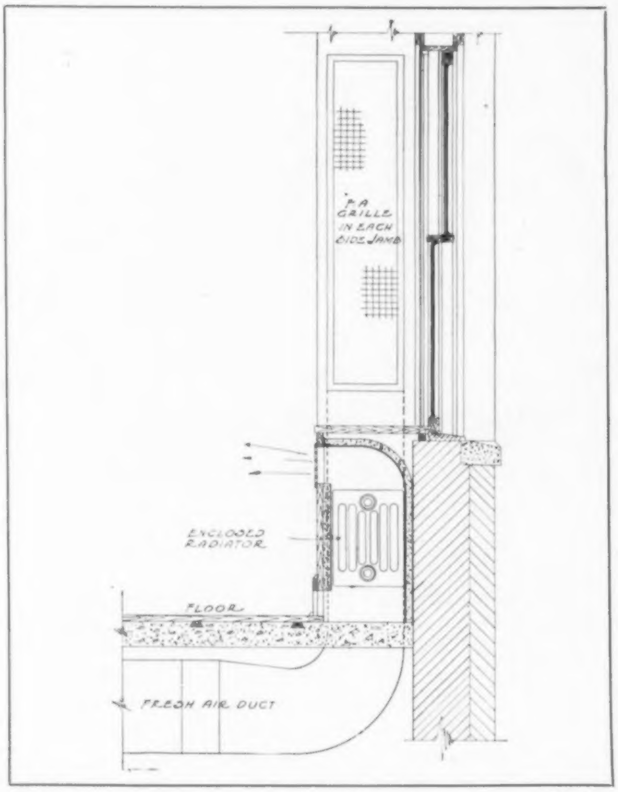


Fig. 3. Typical Method of Providing Fresh Air for Dining Rooms, Ball Rooms, Etc.

nace system of heating and ventilating. Furnaces are now being marketed with fan circulation which makes them very positive and economical in operation. In any furnace installation, recirculation ducts should be provided from the main stair hall and the principal first floor rooms to the fresh air intake of the furnace, and louvered openings should be installed in the walls or doors of second floor rooms leading into the main hall so as to prevent the wind pressure against any particular room from retarding the flow of heated air to these rooms. Such a recirculation arrangement is very economical for heating up or for regular use in extremely cold weather.

Hotel Heating Apparatus. The heating of hotels is generally by steam and sometimes by hot water. The boiler horse power requirements for modern hotels in our northern cities are about these:

For bedroom for heating and ventilating	0.75 to 1.00
For 1000 cubic feet for heating and ventilating	0.2
For bedroom for heating water	0.25
For bedroom for refrigeration	0.10
For kitchen for a 100-room hotel about	15.00
For a 1000-room hotel (kitchen) about	30.00
For laundry for a 100-room hotel about	20.00
For a 1000-room hotel (laundry) about	50.00

This represents an average of about 1.3 boiler horse power per bedroom for all purposes.

The maximum electrical requirement for the average hotel is about 0.5 kw. per room for all purposes. If this is generated on the premises it will require about 1.9 boiler horse power per bedroom. Assuming that 80 per cent of this is available as exhaust for use for heating and hot water, it will be seen that it about balances the average heating and hot water load, figuring 40 per cent of the maximum as the average heating load. There are certain variations in load factors, however, and while the lighting and hot water loads decrease only slightly during the summer months, the heating load disappears, so that there is a preponderance of exhaust steam to be wasted from April to November in the colder climates and for a much longer period in the warmer climates. Generally speaking, a private generating plant for furnishing the electric current for light and power and exhaust steam for heating and hot water becomes a financial success where current from the outside costs 2 cents or more per kw. hour and may range from this up to 5 cents per kw. hour for the warmer climates. Nothing is included in these figures for management and general business overhead for the operating of such an added department. If such a department entails added expense to an organization not already equipped to manage it, the rates given here should be increased.

There are two points which should be borne in mind, however. One is that the refrigeration may be steam-driven and furnish just about sufficient exhaust steam to generate the hot water. This is not apparent at first, since the maximum hot water demand represents from two to three times the boiler horse power required to drive refrigeration machines, but the total daily consumptions are about equal. The only requirement necessary to take advantage of this is large hot water storage, averaging about 25 gallons per bedroom. Under this arrangement the hot water and refrigeration may be produced for about 20 per cent more than the cost of either when produced separately. The other point is that when a complete generating plant with reserve units is not a paying investment, a single steam-driven turbine unit for use as a pressure-reducing valve on the heating system and to generate the bulk of the electric current with auxiliary and break down cross connection with the public service electric company's lines for taking care of the variations in load during the heating season and the entire electric load during the non-heating season, constitutes a most economical arrangement for almost any hotel or other similar building. For further data as to the boiler and machinery plants of hotels, the reader is referred to the author's article in the April issue of THE ARCHITECTURAL FORUM.

The radiation in the principal rooms should be preferably of the concealed or built-in heater type. Radiators in bedrooms and elsewhere should be preferably of the legless type, hung on walls and

connected to pipes run out of the walls so as to keep all radiators and connections free of the floors.

A vacuum system of heating or a forced circulation hot water system is preferable in a hotel on account of quick response and the positive circulation to all parts of the building at all times. Bathrooms, toilet rooms and public rooms may be piped on separate circuits with centrally located control valves on each of these and on the system supplying the bedrooms, so that any one or more of these sections may be cut off when not required. This is especially important in warmer climates where a little heat is required in toilet rooms and public spaces morning and night when not required elsewhere. Fig. 2 illustrates a steam system for a southern hotel employing separate systems for bathrooms and for bedrooms. Sometimes heating equipment is omitted from interior bathrooms, and in some such cases the radiator for the adjacent bedroom is placed near the bath so as to serve both. While an interior bath (without exposure) requires little heat, it must be warmer than the bedroom should be so early in the morning before the bedroom is heated, after being ventilated and cooled by open windows during the night. To try to heat both rooms with one radiator not only requires more surface and more fuel, but it also defeats the requirements mentioned. Fig. 4 shows a good arrangement of bedrooms with interior bathroom heating.

Hotel Ventilating Apparatus. It is of the first importance that the kitchen of a hotel be ventilated. Next in order of their importance as to ventilation are the toilets, dining rooms, ball rooms, assembly rooms, public rooms, lobbies, barber shops, laundries, store rooms, and machinery rooms. Bedrooms are rarely supplied with artificial ventilation except indirectly through exhaust from adjoining bathrooms. Corridors of the bedroom floors, especially the lower floor corridors of tall hotels in warm climates, are sometimes equipped with exhaust ventilation. Kitchens usually occupy from 50 to 80 per cent of the floor space required for dining rooms. Dining rooms are proportioned on from 8 to 12 square feet of floor space per person served. Kitchens must have exhaust ventilation of from 20 to 40 air changes per hour. Most of this may be exhausted through the hoods of ranges, dishwashers and urns, but in larger kitchens there should be exhaust outlets distributed around the rooms, especially in alcoves, under galleries, around ranges, steam tables, etc. Toilet rooms should have from 20 to 60 air changes per hour; interior baths 10 to 15; dining rooms 6 to 12; bathrooms 6 to 10; assemblies 10 to 15; lobbies 4 to 6; store rooms 1 to 2, and machinery rooms 6 to 12. The intensity of ventilation is to be varied with the character and requirements of the operation and the type and character of apparatus used. With good air conditioning apparatus and a well designed distribution system, the intensity of ventilation may be reduced to or below the minimum figures given here. Double mechanical systems require less air

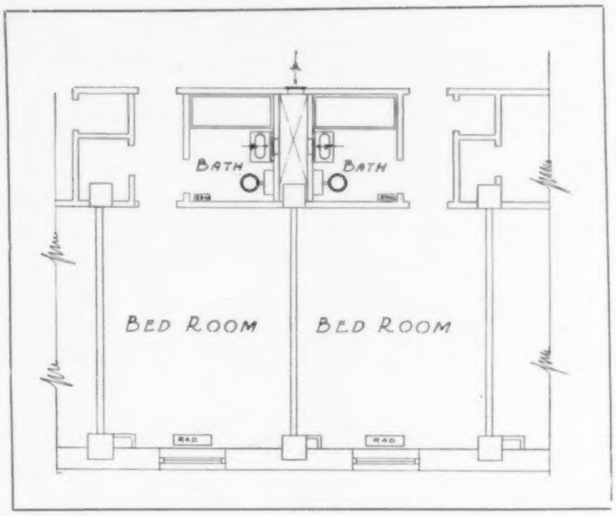


Fig. 4. Exhaust System for Interior Baths

than either the single-supply or the exhaust system.

Duct Sizes. As a rough guide for the sizes of main ducts, the velocity in supply ducts leaving the fan may range from 900 to 1200 feet per minute, but should be gradually and progressively reduced, in accordance with accepted practice, throughout the duct system leading from the fan. Main exhaust ducts may have velocities ranging from 800 to 1000 at the fan inlet with gradual and progressive reductions throughout the systems. A rough guide to the space occupied by single-width fans may be had on the assumption that the outside length is twice the width, and the capacity in thousands of cubic feet of air per minute equals the product of the length by the width in feet. The height is about 1⅓ times the length. Double-width fans of the same diameter have twice the capacity. This gives ample space, which may be slightly reduced when the apparatus is actually laid out. Fig 2 illustrates a typical layout of exhaust ventilation for both interior and exterior bathrooms. Fig. 5 shows a typical hotel ball room with exhaust ventilation. The fresh air may be taken in through concealed radiators or heaters as shown in Fig. 1, or from a fan supply system through a system such as shown in Fig. 3. Large portions of the kitchen air supply may be taken from the dining room if adjacent to, above, or below the kitchen, thereby assisting in ventilating the dining room and tending to carry the cooking odors and noise toward the kitchen and away from the dining room. The air supply for all portions of a hotel should be filtered and washed, and automatic humidifying apparatus should be provided. In some of the better installations, air cooling and dehumidifying apparatus may be used in dining rooms and assembly rooms. This subject was also discussed generally in THE ARCHITECTURAL FORUM for April, but there are several specific points which may well be covered here.

Department Store Heating Apparatus. Department store heating is a comparatively easy matter as far as the heating system itself is concerned. It is usually vacuum steam or forced hot water and

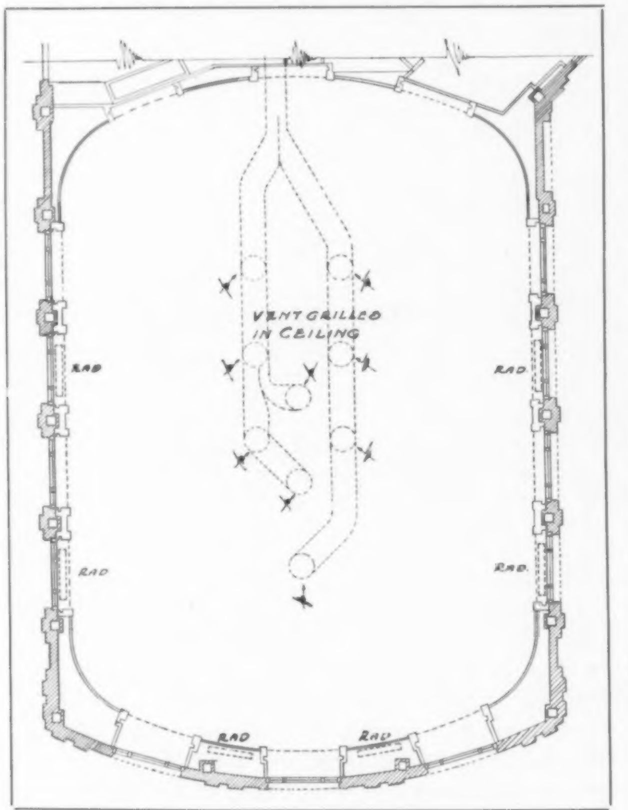


Fig. 5. Typical Ball Room Exhaust System

should be under automatic control for the main sales floors if not for the entire building. The first floor and bargain basements of the modern city store are so congested, have so little exposure, and there is so much heat given off by lights, machinery and people that the problem is one of cooling rather than heating most of the time. The first or street floor does require special attention for the heating around entrances. If this is not properly taken care of, the entire first floor may be drafty and disagreeable. These conditions are usually met by a proper combination of the heating and ventilating systems. A private generating plant is not so likely to be a paying proposition in a store as in a hotel, as the heating requirements are less in proportion to the available exhaust steam. Where much refrigeration is required for fur storage or for air cooling, an absorption refrigerating system, using this surplus exhaust steam, may be employed to reëstablish this balance. A plant may become a paying investment under such conditions. High pressure steam is generally required for cooking and for sterilizing, etc., so that the entire boiler plant is usually operated at around 100 pounds pressure.

Department Store Ventilating Apparatus. The street floor and all sales basements should have the best kind of supply and exhaust ventilation. The fresh air supply should be at least filtered, washed and tempered under automatic control, and the washers should be arranged for humidifying and humidity control. The fresh air should be brought in high around the walls, especially over show windows, and the exhaust should be taken out through grilles in the floor cases, well distributed over the entire floor area. Two or more floors may be ventilated together with the same volume of air where conditions are favorable. The street floor, where ceilings are high and the crowding less than in the basement, may be supplied with fresh air which in turn is exhausted through the floor for ventilating the first basement. Air cooling is frequently used for the main sales floors, especially for bargain basements, and sometimes for dining rooms and assembly rooms. A complete system affording dehumidifying cooling and reheating for summer, and heating and humidifying for winter, all under automatic control, should be employed. The partial cooling of air without enough refrigerating capacity to reduce its moisture content and without reheaters to raise the temperature to within 6 to 8 degrees Fahr. of the outside temperature will result in a chilly, humid, disagreeable atmosphere. A good store ventilating system, employing filtered and washed air but without air cooling and dehumidifying, costs about $50 per 1000 cubic feet of space ventilated. A system for air cooling and dehumidifying will cost about 50 per cent more.

To overcome the drafts and cooling effects caused by cold air being drawn in through the street entrances, two precautions are usually taken. One of these is to supply more air to this floor than is exhausted through the ventilating system so as to allow the excess to pass through the elevator shafts and stairs which would otherwise draw this air in through the entrances. The other is to supply large volumes of reheated air to the vestibules, thus providing a warm greeting to patrons and at the same time insuring that the air which leaks in is warm. Dining rooms, kitchens, assembly rooms, waiting rooms, toilet, store rooms, machinery rooms, etc., should be ventilated as for hotels.

Commercial Buildings. Stores, restaurants and assemblies may use the same kind of apparatus as specified for hotels and department stores. The cost of apparatus for this class of building ranges from 5 to 10 per cent of the cost of the building. The heating and ventilating apparatus for the commercial type is discussed in the author's article in THE ARCHITECTURAL FORUM for June.

Industrial Buildings. These may be very successfully heated by forced circulation hot water or by vacuum steam. Unit heaters are used very extensively and are very efficacious, especially in rooms with tall ceilings. The use of units tends to keep the heat down in the working zone and at the same time saves floor and wall space, piping, etc. Central fan systems are used to accomplish the same purpose and usually work out best where particular air conditioning is necessary. For relative costs of different kinds of heating and ventilating systems for industrial buildings see *The American Society of Heating and Ventilating Engineers' Journal* for January, 1928.

SANITARY DESIGN IN MODERN BUILDINGS

BY

HAROLD L. ALT

SANITATION has grown in recent years to be an important consideration,—especially in buildings of considerable size. There are probably two reasons why the architect must consider sanitation and plumbing,—first, plumbing installation is more or less dogmatic and is largely controlled by local plumbing codes with which the architect must comply; second, the plumbing pipes, which are of sufficient size, require special concealment, so that an architect must take into account the locations of these pipes in connection with the structural and architectural features of the building. In its humble way, plumbing quietly provides a "service" in a building that is essential to health and comfort. Every architect realizes that it is necessary to have a sufficient number of toilet rooms scattered through a building to adequately serve the occupants, and he must consider the desirability of having outside windows in such rooms, the desirability of artificial ventilation, and the absolute necessity of providing mechanical ventilation in toilet rooms without windows.

Number of Plumbing Fixtures. It is not desirable to install fixtures which may never be required, but it is even worse to have a shortage of fixtures. In buildings where the number of occupants per floor or per section of a floor can be approximated with reasonable accuracy, the number of plumbing fixtures should be proportioned to the number of occupants. In an office building the space is not rented nor are the partitions located at the time the structure is designed, and consequently the number of plumbing fixtures must be proportioned to the area.

PLUMBING FIXTURES PER 100 PUPILS FOR AMERICAN SCHOOLS

Fixture	Max.	Min.	Average (per 100 pupils)
Waterclosets	7.29	2.95	4.92
Urinals	2.19	1.47	1.79
Lavatories	10.22 (a)	1.82	4.90
Drinking Fountains	4.66	0.52	1.68
Slop Sinks	1.11	0.26	0.68

(a) Excessive.

The variations in the figures, which are based on actual schools, are due somewhat to the increased facilities provided for the younger children in the grammar schools. An average of five high schools and three grammar schools ranging from 500 to 2,000 pupils shows this interesting tabulation in the ratio of fixtures to each 100 occupants:

Fixtures:	Waterclosets		Urinals		Lavatories	
Class of Building	Max.	Min.	Max.	Min.	Max.	Min.
High Schools	5.33	2.95	2.19	1.47	10.22 (a)	2.26
Grammar Schools	7.29	6.03	2.18	1.57	6.43	1.82

(a) Excessive.

These same buildings have also been worked out on a cubage basis, the buildings ranging from 500,000 cubic feet to 4,500,000 cubic feet. Maximum and minimum ratios for the high schools and grammar schools show these figures per 100,000 cubic feet:

Fixtures:	Waterclosets		Urinals		Lavatories	
	Max.	Min.	Max.	Min.	Max.	Min.
High Schools	3.31	2.09	1.54	0.73	4.09	2.11
Grammar Schools	7.00	4.36	2.40	1.03	4.27	2.00

NUMBER OF OCCUPANTS PER FIXTURE FOR MEN

	Waterclosets		Urinals		Lavatories	
	Aver.	Max.	Aver.	Max.	Aver.	Max.
Auditoriums	150	250	300	400	150	300
Banks	16	20	25	35	15	25
Churches	150	200	300	400	150	300
Clubs	50	100	200	300	100	150
Department Stores	100	200	250	300	100	200
Factories	25	30	50	60	20	30
Hotels			(See Note A.)			
Hospitals			(See Note B.)			
Libraries	150	200	300	400	150	300
Office Buildings			(See Note C.)			
Public Buildings			(See Note D.)			
Schools			(See Note C.)			
Theaters	150	250	300	400	150	300
Y.M.C.A.			(See Note E.)			

NUMBER OF OCCUPANTS PER FIXTURE FOR WOMEN

	Waterclosets		Lavatories	
	Aver.	Max.	Aver.	Max.
Auditoriums	100	150	150	300
Banks	10	15	15	25
Churches	100	150	150	300
Department Stores	75	125	100	200
Factories	15	20	20	30
Hotels		(See Note A.)		
Hospitals		(See Note B.)		
Libraries	100	150	150	200
Office Buildings		(See Note C.)		
Public Buildings		(See Note D.)		
Schools		(See Note C.)		
Theaters	100	150	150	300
Y.W.C.A.		(See Note E.)		

Note A—Modern hotels usually install an individual bathroom for each bedroom, the bathrooms being supplied with one watercloset, one lavatory and one bath or one shower or a combination of both.

Note B—Hospital fixtures are so varied in type and so special for the services required that no standards of quantity can be quoted.

Note C.—Given in detail elsewhere in this article.

Note D—Varies depending upon use of building and accommodation desired.

Note E—Varies in different parts of the building according to the uses at different floors.

A few office building ratios are also given for what they may be worth, although it should not be forgotten that these four buildings are all in service and that the plumbing fixtures have proved adequate.

SQUARE FEET OF FLOOR AREA PER FIXTURE

Building	Men's W.C. Sq. ft.	Women's W.C. Sq. ft.	Urinals Sq. ft.
Office Building No. 1	5143	7200	7200
Office Building No. 2	2050	4100	4100
Office Building No. 3	5038	7316	7316
Bank & Office Building	3435	6870	3435

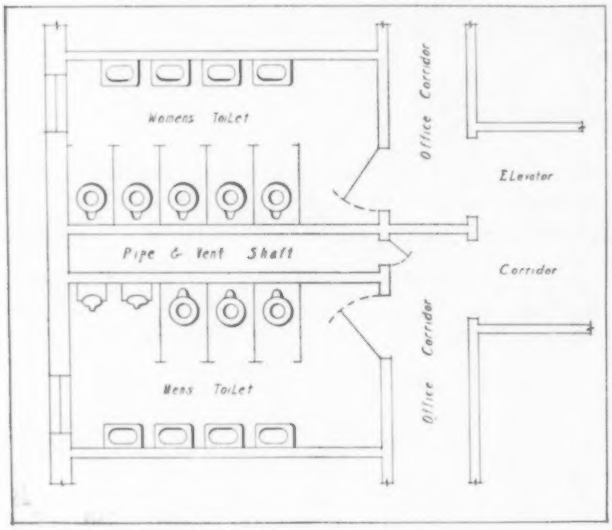


Fig. 1. Arrangement of Fixtures in an Office Building

Arrangement of Fixtures. In arranging toilet rooms it is usually desirable to place the urinals next to the windows, then the waterclosets, and the lavatories close to the toilet room doors. Where a room is wide enough, the lavatories may be located on the opposite wall near the windows, as in the arrangement shown in Fig. 1. Consideration should also be given to toilet room locations so as to serve all portions of each floor without too great a travel distance. In large buildings the cheapest arrangement, as far as installation cost is concerned, is to place the toilet rooms for each sex adjacent to each other so as to use the same risers and vent shafts. Care must be taken, however, to keep the doors as far apart as possible, and, preferably out of sight of each other. A typical layout is indicated in Fig. 1. Where the travel distance from the farthest office door to the toilet room door exceeds 200 feet, the toilet room becomes an inconvenience rather than a convenience, and it is far better to place two groups of smaller toilet rooms on each floor than it is to use only one larger group and thus double the travel distance. Moreover, with two groups of toilets, one may be used in case of difficulty with the other. For very small office buildings, an economical arrangement is to locate the toilet rooms off the stair landings midway between floors, and to alternate the rooms,—between the first and second floors would be, say, a young women's toilet; between the second and third floors, a women's toilet; between the third and fourth floors, a men's toilet, etc., to the top of the building. With this arrangement access to a toilet for either sex is obtained from each floor by either going down or up half a flight of stairs.

Toilet rooms are so much governed by local conditions in the building that it is hard to give anything in the nature of a standard arrangement. If it is remembered to put the fixtures most requiring ventilation next to the outside windows, to screen the entrances from passing observers, to keep the entrances for toilets accommodating opposite sexes out of sight of one another, and not to make the travel distances too great, the chief toilet room demands will have been met. It is also a good thing to introduce a slop closet and slop sink so as to use

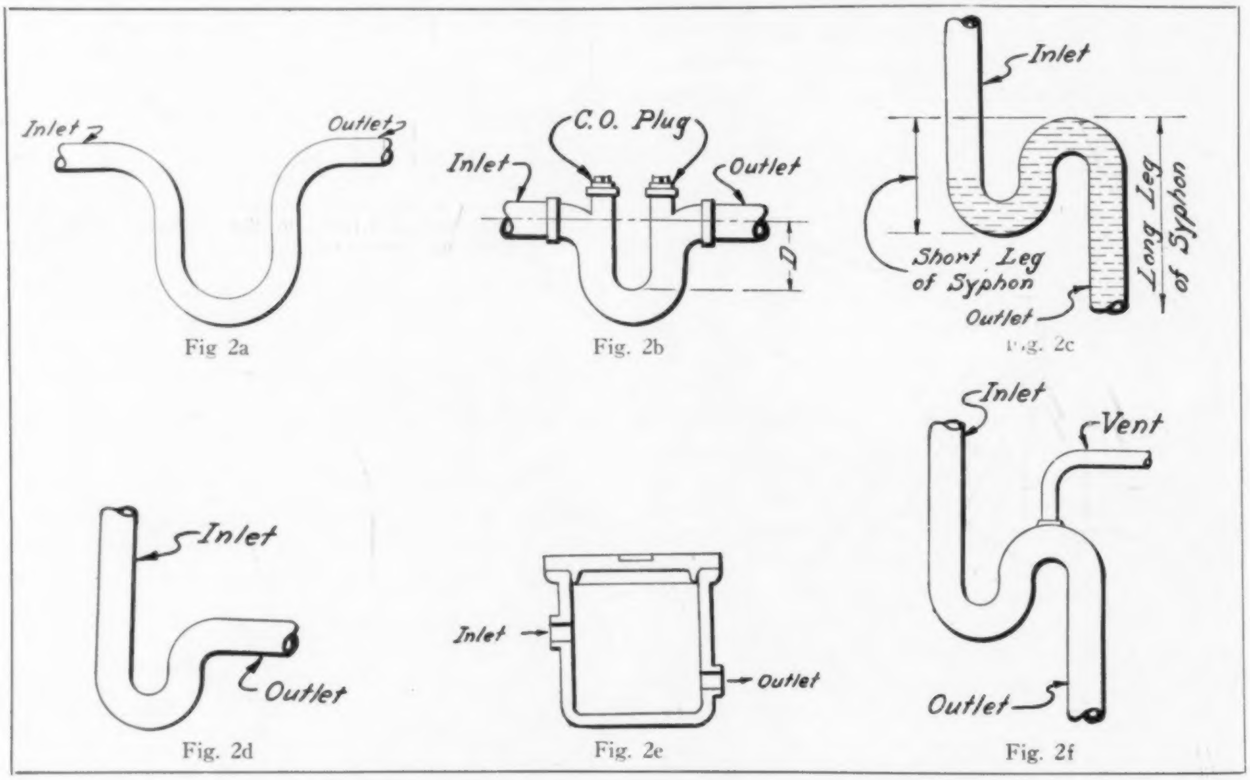


Fig. 2. Various Types of Plumbing Traps: 2a and 2b, Running Traps; 2c, "S" Trap; 2d "P" Trap; 2e, Pot Trap; 2f, Crown Vented "S" Trap.

the same piping as the toilet rooms where possible, as this makes separate plumbing risers for slop sinks unnecessary. Floor drains are not usually installed in toilet rooms, owing to the fact of insufficient water being used to keep the traps filled; they are still used in some cases, but it is questionable if they are necessary, and they certainly are undesirable. Drinking fountains are usually limited to corridors, where the surrounding walls and floors should be well protected against splashing.

Plumbing Traps. The basic idea underlying all plumbing design as far as the soil, waste and vent systems are concerned, is that all sewer gas generated either in the street sewers or house drainage pipes must be prevented from entering the rooms. As far as the pipe system itself is concerned, sound pipes and gas-tight joints are necessary. The openings which must be made in the piping system for the drainage outlets of fixtures cause the real difficulty. The most satisfactory solution yet found is to water-seal such outlets by means of what is commonly termed a trap. In its simplest form this is nothing more complicated than a bend in the waste or soil pipe made so that water is trapped and retained, thus preventing the flow of gas or air. The first passage of water through a trap leaves a sufficient quantity of water to form a seal against gas or air, as shown in Fig. 2b, where the depth of the water seal is indicated by "D."

There are many kinds, styles and designs of traps, so many that a whole article could be devoted to their illustration and description and still leave the subject far from complete. Most traps, however, fall into four or five general classes which may be listed as "S" traps, "P" traps, pot traps and various special traps, shown in Fig. 2. Some traps are integral parts of the plumbing fixtures,—such as water-

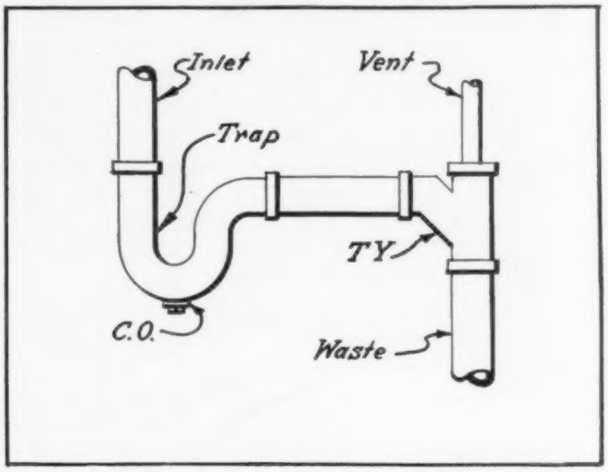


Fig 3. Good Venting Practice

closet traps, slop sink trap standards, etc.; other fixtures, as lavatories, baths, sinks, etc., must have the traps supplied in the waste piping. A favorite provision in many plumbing specifications is, "Each and every fixture must be properly trapped." While the water-seal does prevent the free flow of gas into the room, the seal may be "broken" by the loss of the water. In many instances syphonic action is set up by a heavy flow of water through the trap, or even by a heavy flow from some nearby fixture, which, in passing rapidly down the waste line, leaves a partial vacuum in its wake, or builds up a pressure in front of it. The syphonic action is illustrated in Fig. 2c and when the water is drawn out of the trap of a fixture by the discharge of the fixture itself, the action is termed, "self-syphonage," whereas, if the water is drawn out by the discharge of an adjacent fixture or fixtures, the trap is simply "syphoned."

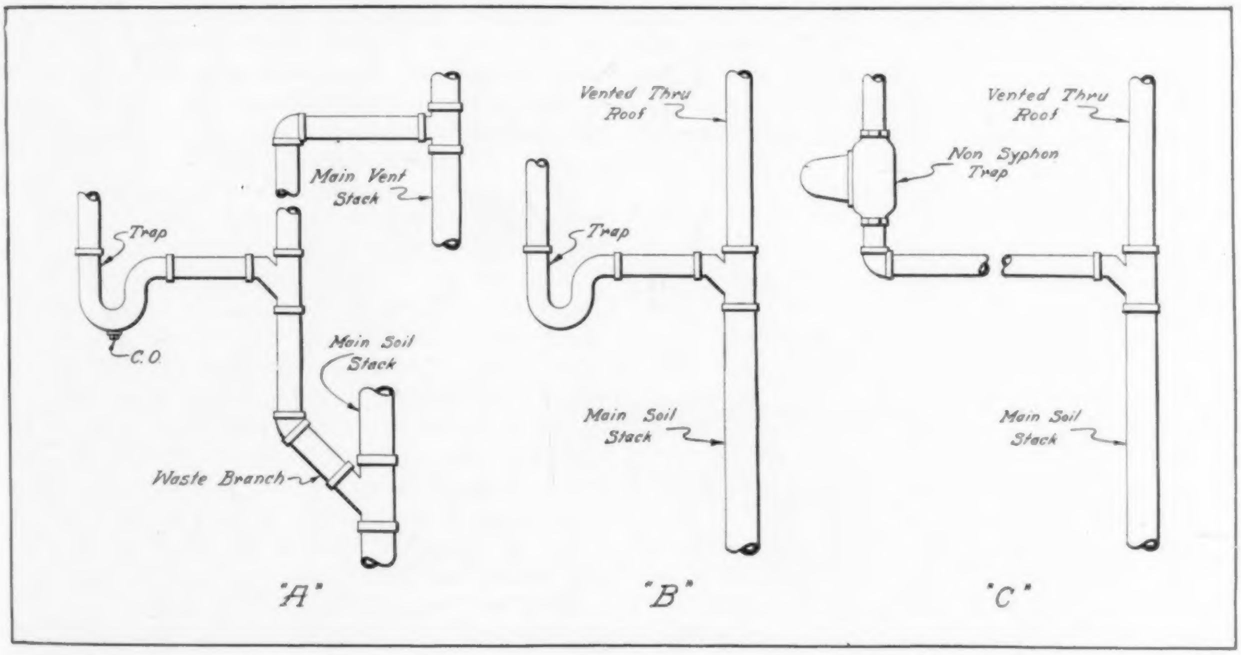
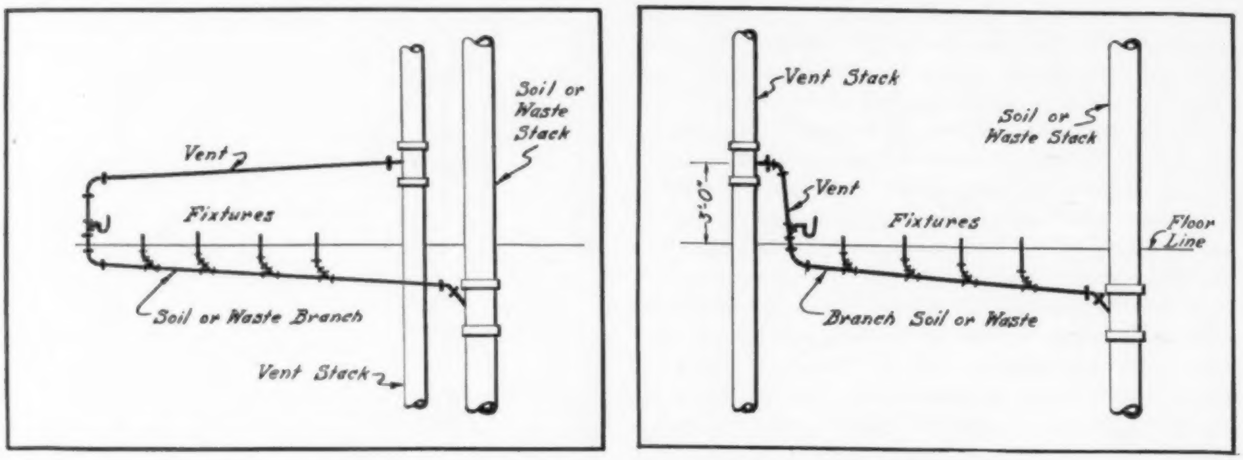


Fig. 4. Modern Venting Practice; "A," Continuous Vent for Lavatory; "B," Circuit Vent for Lavatory; "C," Circuit Vent for Fixture at Distance from Soil Stack.



Figs. 5 and 6. Two Arrangements of "Loop" Venting

There are three ways of preventing syphonage and self-syphonage. One is to make the trap so deep that the water-seal cannot be syphoned out by any ordinary contingency; this is hardly practical owing to the increased danger of stoppage occurring in such deep traps. The second method is to make a large reservoir in the trap so formed, that although the trap may be partially syphoned, there will still be enough water retained in the chamber to reseal the trap. The third method is most commonly employed and is known as "venting" or "back venting."

Venting. The fundamental idea of the vent is the principle that a syphon can be broken by a very small hole admitting air to the top of the syphon. In venting plumbing traps the "very small hole" is made a fairly good sized hole to make it more difficult to clog up by splashings, scale, rust, etc. Theoretically, such a vent should be attached to the high point of the trap, as illustrated in Fig. 2f, and vents were so connected for many years. The vent so located was very quickly blocked by particles thrown up into it by centrifugal action of the water as it flowed around the bend. While there is considerable confusion in the terms applied to vents and venting in different parts of the country, a vent connected to the high point or crown of the trap is generally termed a "back" vent or "crown" vent. To overcome the clogging of the vent opening a method of piping was devised which is usually termed a "continuous" vent. With this type of vent a "P" trap is necessary, and instead of venting at the high point, the outlet is carried horizontally a short distance (usually not to exceed 18 inches) and is then connected into a drainage tee or TY, from the bottom of which the waste is taken and to the top of which the vent is connected as shown in Fig. 3. This method of venting is regarded today as being the surest way, and is the method required in New York.

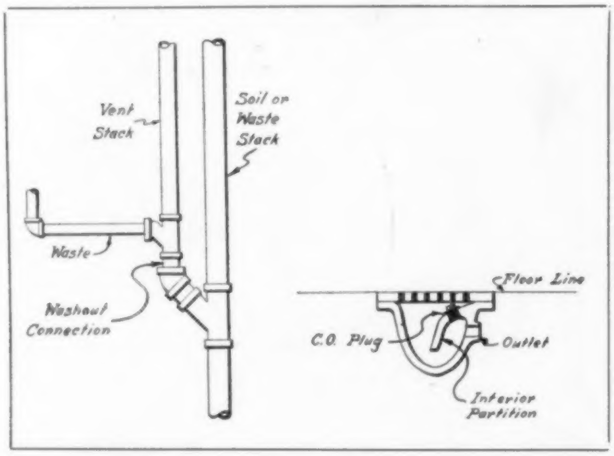


Fig. 7. *Left:* Washout Connection at Base of Vent Stack. *Right:* Partition Trap, to be Avoided.

Waterclosets, stall urinals, baths and bottom outlet slop sinks do not lend themselves to continuous venting. Fixtures which permit the use of a true continuous vent are the sink, lavatory, wall hung or lip urinal, back outlet slop sink, and laundry tray. With waterclosets a vent is usually taken off the vertical side of the lead bend immediately below the fixture. Bottom outlet slop sinks are similarly treated; stall urinals and bath traps have tees on the waste lines immediately beyond the traps to which the vent connections are made. Another method of venting is known as "circuit" or "loop" venting. In many ways this method of venting seems just the opposite of that just described. With "circuit" or "loop" venting there is no individual vent connection to the soil or waste from the fixture; instead, the main soil or waste line itself is vented and the fixture traps are kept as close as possible to the vented line. This is the method used in Philadelphia and many other places, although various minor modifications are incorporated in the requirements of the different cities. In some localities the rule is to have regular traps on fixtures and to keep the traps within certain specified distances of the vented line; in others, traps are allowed at greater distances from the vented line but are required to be of the non-syphon type; in still others, all wastes up to certain lengths can be carried into a vented stack singly and without vents, but if two wastes are united at any point, then that point must be vented. In theory,

circuit or loop venting makes the main vented soil or waste line or the main vent itself perform the function of a continuous vent. The way in which this is done is indicated in Fig. 4, where "A" is a continuous vent for a lavatory, "B" a circuit vent for the same fixture, and "C" shows the usual method employed in circuit venting when the fixture is farther away from the vented line. The term "loop" vent has been developed from applying circuit venting to batteries of fixtures, the end of the waste pipe being "looped" back to the soil or waste pipe, or,—if there are other fixtures above on the same stack,—to a separate vent stack as shown in Fig. 5. Sometimes to save piping the main vent stack is placed at the opposite end of the battery from the soil or waste stack and the end of the horizontal drainage is connected into the vent 3 feet above the floor. Fig. 6.

Every vent stack should have a washout connection made at the bottom by emptying the waste from some fixture (usually not a water closet) into the base of the vent stack in the manner shown in Fig. 7. The idea back of this is to wash out dust, dirt and scale which otherwise might settle at the bottom of the stack and in time cause trouble. House traps and fresh air inlets in general seem to be included with continuous venting and are often omitted with circuit venting; this rule, however, has many exceptions. The original idea back of the requirement calling for a house trap is to exclude from the building the sewer gas originating in the street sewers and to allow a current of fresh outside air from the fresh air inlet to circulate through the house lines. If the house trap is omitted, then the air circulating through the house piping is from the street sewer and is more than likely to be sewer gas. Consequently, if a trap in the building should be syphoned in spite of the venting precautions taken,—or a cleanout should be opened up temporarily for cleanout purposes,—it is likely that the air coming from the drainage system would not be as objectionable with a house trap and fresh air inlet installed as it would with the house drain connected to the street sewer with an untrapped run of pipe. All good plumbing codes prohibit the use of traps depending for their waterseal on an interior partition of the trap. An example of this type of trap, which should be avoided, is shown in Fig. 7, where the cleanout screw is particularly objectionable owing to the ease with which an opening can be made through the partition by the removal of this screw.

Floor drains are seldom if ever vented, for three good reasons; in the first place a floor drain usually has a deep seal trap and a comparatively large quantity of water retained in the trap, so that its syphonage is difficult; in the second place it is not subject to sudden and concentrated discharges of water; and, third, it is likely to have long periods of disuse, when there is a tendency for the water to evaporate, leaving the trap dry. This evaporation would be hastened by connecting a vent near the trap and subjecting the water to a circulation of air over its surface.

Roof leaders should always be carried down to the basement separately and should be trapped before entering the drainage system. If leader traps are not installed, sewer gas is likely to find its way up through the leaders and out of the leader boxes on the roof; these leader boxes in some instances may be located close to windows or other points where sewer gas would be objectionable. Area drains, in climates where the outside temperatures go below freezing, should consist of boxes with dirt pockets in the bottoms, and the piping from these boxes should be carried inside of the buildings, trapped, and then connected to the nearest drainage lines. Trouble may develop unless these traps are placed inside of the buildings where they are protected from freezing. No venting is desirable on area drain traps or roof leader traps, because it is open to the objections as in the case of floor drains.

One of the first points to be determined in laying out the plumbing for a building is deciding on the size and elevation of the outside sewer. It is generally considered as good practice to have the invert of the building connection not lower than the top of the street sewer, and of course if it can be kept even higher it is better. The practical objection to coming in below the top of the street sewer is that when this sewer is running full the sewage will back into the house line and may cause a stoppage.

Sub-sewer Drainage. When fixtures or drains lie below the level of the street sewer, as often happens in basements and sub-basements, it is necessary to pump the sewage to a point high enough to permit it to flow to the street sewer by gravity. This is often done by a sewage ejector of the compressed air or centrifugal pump type. Where such ejectors are necessary, they are installed in conjunction with pits or receivers in which the sewage is collected and expelled from time to time by the entrance of compressed air or the action of the pump. Where dependable action is important, such ejectors are generally installed in duplicate, and the discharge pipe is carried out and is connected to the house drain beyond the house trap. A check valve is also placed in this line to prevent the sewage backing down into the ejector after each period of operation. Usually a fresh air inlet is required or a vent on the pit, and in some localities the vents on all lines emptying into the pit must be carried through the roof separately. In other places the vents may be connected into vent stacks used on the gravity lines, thus saving piping.

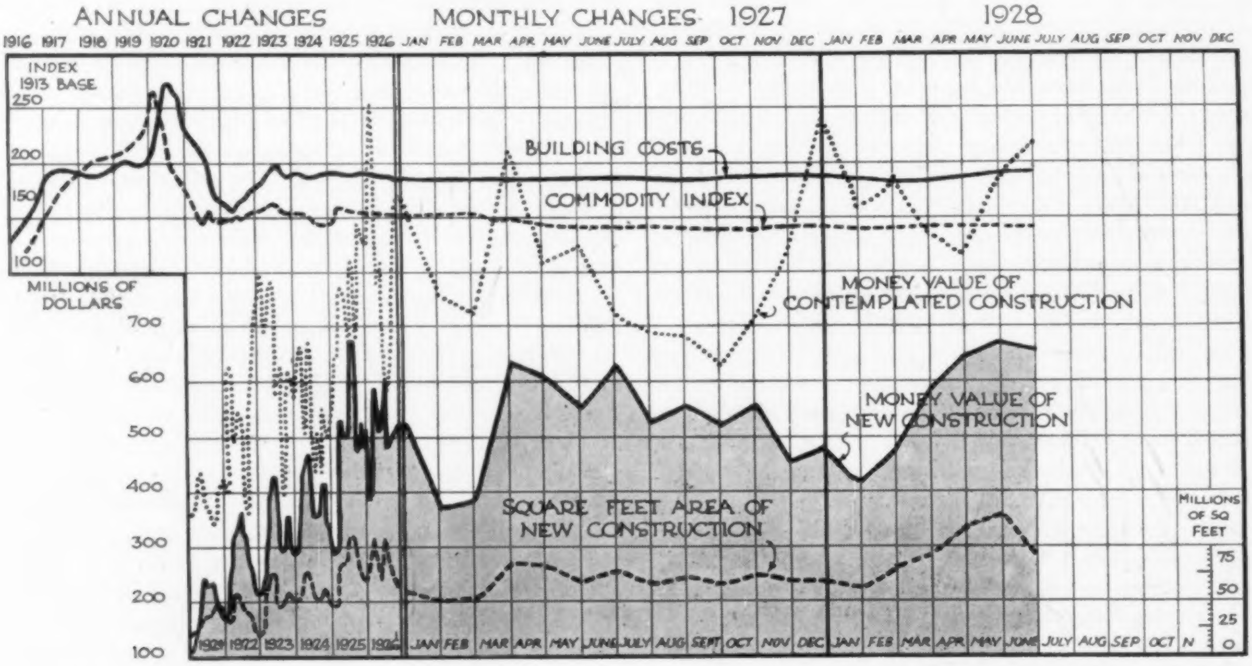
Roof Leaders. When these are not run on the outside of a building, they should be carried all the way to the basement entirely separate from all other piping and at the bottom should have running traps through which they are connected into the house drain. A house drain which carries combined soil and roof drainage is usually sized on the basis of roof water to be handled plus one pipe size for the soil. The carrying capacity of the house drain varies with the pitch, but it can be obtained from almost any handbook having a table on flow of water in sewers.

THE BUILDING SITUATION

THE RETURNS FOR JUNE ESTABLISH NEW RECORDS

THERE has been a rather phenomenal increase in building construction during the first half of 1928, which has been quite contrary to the general predictions made at the beginning of the year, when indications led most experts to anticipate activity approximately equal to that of 1927, or possibly slightly lower. Not only do the figures recorded by the F. W. Dodge Corporation show new records being established for June and for the first six months, but they show an unusually large volume of contemplated new work in several important sections of the country. June construction in the 37 eastern states, representing about 91 per cent of the entire United States, amounted to $650,466,200. This is the second highest monthly total on record, being 3 per cent ahead of the June, 1927 record and only about 2½ per cent under the total for the preceding month of this year. A glance at the chart upon this page shows graphically the comparison of activity between this month and half-year and similar periods since 1920. Contemplated new work reported in June amounted to the exceptional total of $1,030,095,000, which is 17 per cent in excess of the May, 1928 total and 41 per cent ahead of the June, 1927 record.

There has been an interesting change in the type of contruction contituting these totals. The June contract record included 40 per cent of all construction for residential buildings, 20 per cent for public works and utilities, 14 per cent for commercial buildings, and 10 per cent for industrial projects. This represents a lessening predominance of residential construction and an increase in industrial work and public works utilities. The regional situation is particularly interesting. New York state and northern New Jersey established a new record for June in new building contracts, and an increase of 9 per cent for the first six months over the total for the first half of last year. Contemplated construction shows an increase of 77 per cent over the total for June, 1927. In the New England States new construction showed a 15 per cent increase over the total for June last year, but a drop of 32 per cent from the amount reported in May, 1928. The first six months' construction totals 21 per cent higher than the corresponding period of last year, while contemplated new work is more than double the amount reported for last June. In the Middle Atlantic States a new June contract record was established. While the six months' total represents an increase of 12 per cent over the corresponding period last year, contemplated projects dropped 19 per cent from the amount reported for the month of June, 1927.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

PAYMENT FOR ARCHITECTURAL SERVICES

DETERMINING AND COLLECTING FEES

BY

C. STANLEY TAYLOR

WITH the exception of a relatively few well established architectural offices whose prestige has brought them an extensive clientele of the highest quality and whose business enables them to decline commissions from prospective clients of doubtful credit rating, practically every architectural office experiences at some time or other serious difficulties over the problem of securing adequate architectural fees and of collecting the fees which have been charged and earned. It may be safely said that every architect has given this problem of fees and their collection a great deal of serious consideration. It is a subject worthy of more frequent discussion and exchange of ideas for the benefit of the profession. This is a two-fold problem,—what to charge, and how to get the fees charged. Each of these phases has various aspects worthy of consideration, among which several might be noted. In establishing architectural fees, the architect must determine the value of the services, the basis upon which he establishes his charges, and the variations in charges based upon different types of service rendered. The problem of getting the fees involves salesmanship, the rendering of service commensurate in value with the fees charged, the conducting of his work so that the client will have no hesitancy in paying the established charges after the agreement has been signed, and finally protection against losses through bad credit.

Professional service can rarely be measured by accurate, fixed standards. Doctors have long been accustomed to charging for their services in accordance with their patients' capacity to pay, rendering some services free and charging high fees for equivalent services to others. Lawyers have followed somewhat the same course, although in that profession the tendency is to charge in accordance with the importance of the case, because there is no obligation to accept work when called upon, as in the case of the medical profession. Architects, however, have established a custom of basing their fees on a percentage of the cost of the work carried out under their direction. While this is not a fixed practice for all types of work, it is largely prevalent, so that the general public has learned to measure the cost of architectural services in terms of a percentage of the cost of the work designed and carried out. There is, therefore, in the architectural profession, something in the nature of a fixed or standard charge, and a real problem revolves around deviations from this standard charge, made necessary either by unusual conditions arising on a specific problem, or by variations in the caliber of the services rendered, resulting from less or greater experience and knowledge, with a correspondingly less or greater value of the services to the client. From the client's point of view, architectural services are seldom rated at their true value, probably because clients rarely appreciate the amount of work involved and the skill and training required to carry on professional activities. They seldom realize that the average architectural office is something of an organization, with assistants "behind the scenes" to do a great deal of preparatory and detail work, which the client sees only in the form of drawings, specifications or occasional supervision of construction work.

In architectural problems in which economic considerations predominate over æsthetic matters, such as in the development of investment buildings, industrial structures, and the like, the typical client is fairly well able to measure the architect's capacity, because the measure is based on familiar terms, and is measurable in similar structures produced by the architect for others. Likewise, in important institutional work, such as hospitals and schools, and in some more or less technical design problems, such as theaters and the more complex hotels, there is public recognition of the need for special training and experience, and there is usually a willingness to pay without question adequate fees charged for such service. Where æsthetic considerations predominate, as in the development of better residences, the design of churches, public works and monumental structures of various types, the average prospective client is less capable of distinguishing between the value of the services of one architect and those of another, with the consequent result that where cost limitations sway the client's choice, there is a definite tendency to give undue consideration to the fees charged by various architects as against their real capacity to handle the proposed work. It is hardly necessary to say that consideration of the fees charged by various architects influences the selection of architects to a greater or less degree in the great majority of building problems.

The importance of the work accomplished by the American Institute of Architects in establishing minimum fees for various types of work is in no wise diminished by the fact that the very result which was sought has brought along with it other problems to the architectural office, where experience and capacity warrant higher charges than the minimum established. It is true that the minimum fee of 6 per cent for average work is frequently lowered, not only by architects who are not members of the Institute, but occasionally by those who are. This may be due to competition or because a proposed project involves much repetitious work, as in the case of a tall loft building, and the minimum charge is in such cases not only greater than the traffic will bear, but greater than the services are worth. "Cut-rate" architects introduce the most difficult problem in maintaining and getting adequate architectural

fees. They render a service much less complete and probably much less valuable than that rendered by an office which we may call, for lack of better words, a more ethical office. In the large cities this situation is most acute. A case in point personally known to the writer, concerned the designing of a Park Avenue coöperative apartment building in New York, costing approximately $600,000 to build. The promoters paid the architect $3,600 for drawings, including the four elevations, plans of the basement, ground floor, second floor, typical floors, and roof. Into these plans were condensed indications of all mechanical equipment, such as the location of plumbing fixtures, electrical outlets and radiators; but there were no specifications, structural drawings or details of mechanical equipment, and no full-sized details. Obviously, the architect did not render any supervisory service. The promoters turned over the entire project to their builders, and they purchased materials and such equipment as they saw fit and probably used stock designs of cut stonework, ornamental ironwork and other decorative elements as were approximately indicated on the architect's drawings. The normal fee for this project under the American Institute of Architects schedule would have been ten times the fee received by this designer. Actually, the architect designing this building was making a fairly substantial income out of such work, for he put into his plans little of the skill and experience required for a really competent handling of such a problem. In the face of such competition it is not strange that many members of the Institute, striving to maintain the standards to which they are pledged, wonder how they can get adequate work.

The primary purpose of this article is to invite a general discussion of the subject and to secure an interchange of ideas and experiences. A number of important considerations affecting architectural fees are outlined for this purpose, and some matters frequently overlooked when considering the problem are presented in detail. It is evident to many that the standard minimum fee of 6 per cent must be varied in accordance with the amount of work involved in the proposed commission. From various sources we have gained the impression that these factors customarily influence architects in establishing their charges for specific commissions.

1. *Size of the Work.* Few architectural offices can do small residential work on a 6 per cent basis, and the customary charge ranges from 8 to 10 per cent for buildings costing less than $15,000 to possibly $25,000. Some architectural offices are so organized that they cannot take any project costing less than from $50,000 to $100,000 for less than 10 per cent and make a reasonable profit on the work. Large projects, on the other hand, such as great office buildings, large industrial plants and other types of structures running into $1,000,000 or more, can profitably be handled in almost any architectural office for less than 6 per cent, and in some cases charges as low as 4 or 5 per cent may represent an adequate compensation for the services rendered.

2. *Repetitious Work.* Many commercial and industrial buildings and tall apartments, hotels and similar structures repeat typical plan units so many times that the actual design work and detailing are reduced all out of proportion to the cost of the construction. Here again, less than the minimum fee may represent adequate compensation.

3. *Alterations.* The Institute recognizes the extra time, labor and skill involved in handling alteration work by establishing a minimum charge of 10 per cent. This minimum charge is subject to the same variations as the minimum of 6 per cent for new construction, due to the size of the project, the amount of detailing involved, the number of repeated units, and other factors.

4. *Decorations and Special Designs.* The problems involved in interior decoration, and in the design or purchase of furniture and cabinet work, are often more time-consuming than on alteration work, and a still higher fee may be necessary. Interior decorators frequently charge 15 per cent or more or obtain this amount of compensation through their discounts, and architects cannot afford to handle the work on a lower basis than a decorator. Frequently this problem is solved by a *per diem* charge, independent of the cost of furnishings and decorations.

5. *Consultation and Testimony.* Architects are frequently called upon for consultation work only or for court testimony, and for such work no percentage fee is possible. Here the charges must be based,—like those of the lawyer,—on the importance of the case and the value to the client of the services.

6. *Building by the Sub-contract Method.* The Institute has established a 4 per cent extra charge for handling construction work direct with sub-contractors, and this charge is exclusive of the cost of a resident superintendent. Usually this charge is adequate for the extra services performed, but the responsibility involved deters many architects from undertaking such contracts, regardless of the compensation. Firms engaged in large projects and equipped to handle the routine office problems and field supervision involved in sub-contract construction may properly make a lower extra charge and still be adequately compensated.

7. *The Value of Services.* The final governing factor is the relative value of the services rendered, due to the exceptional experience, talents and prestige of individual offices. This is a most difficult matter to estimate, and the problem is usually solved by charging what the traffic will bear and cheerfully declining prospective commissions where the client is unwilling to concede that value is represented in the higher than normal charge. Thus, the first problem is to establish a sound and fair fee for each individual project, based on the nature of the work to be performed and the intangible matter of the value of the services to the client. In the opinion of many, it is much more ethical to vary fees in this manner than to adhere to standard rates, making some clients

pay greater profit to balance losses on some others.

The next problem is in maintaining the established fees in competition. Only a small percentage of the architects of the country do not at some time or other have to seek desirable work. They are faced with a definite trading problem. Shall they bargain for a commission by cutting fees, or not? This is probably the most critical matter that ever arises in the development of an architectural practice. Under these circumstances the office gets the reputation of being a cut-rate office or a reputation for knowing the value of its services and maintaining its standards against all comers. The latter, of course, ultimately is the only sound course, provided the fees charged are actually commensurate with the value of the services rendered. Rather than offer a reduction in charges to secure desirable work in friendly competition, the successful method in the long run is to confine selling activity to presenting evidence of the fairness and reasonableness of the fees charged, based upon experience, past work, client's recognition of meritorious services, and prestige. More particularly, the reasonableness of the fees charged may be demonstrated by the nature of the architect's organization, the degree of responsibility he assumes, the completeness of the drawings and specifications he prepares, and the adequacy of supervision rendered by the architect's office. These are the real selling points for architectural services, for these are the things in which offices vary and which really measure to the client what he receives for the amount he pays. Selling effort is still repugnant to many architects, but subconsciously or otherwise, every architect does a certain amount of selling and is to a certain degree a successful salesman.

This brings us logically to the problem of how to get architectural fees. Broadly, this implies how to get commissions, but we cannot devote much time here to a discussion of selling methods. Basically the most successful method of getting new commissions is to incorporate into each project that is done within the office, such meritorious work that it will automatically bring recognition of capacity and ability, and with it new commissions. The problem of getting fees has other aspects of equal importance; we shall concern ourselves here with getting fees after the contract has been established. This phase of the problem has two distinct aspects. They are difficulty in collecting fees due to misunderstandings or trouble in the conduct of the work, and those due to bad credit of the clients. The conduct of every architectural project from the development of a $10,000 house to the designing and construction of a $5,000,000 hotel involves such a maze of problems and so many conflicting considerations that it is rare indeed that the entire project goes through smoothly without misunderstandings or even grave conflicts with the client. We can dismiss from consideration here the difficulties and misunderstandings that may develop with contractors or within the architect's own office, except insofar as they influence the client's appreciation of the services rendered and his willingness to pay the entire fee agreed upon. Architects have been forced to the realization that a successful practice involves very rigid conducting of office practice on the most businesslike basis. Only through exercising extreme care to reach a complete agreement with the client upon every detail as each problem develops can the architect safely protect himself from controversies which may cause the client to feel that the architect has been lax in his service.

Beginning with the very first relations with the client, it is most vital that the agreement that is reached be completely understood by both parties and expressed in a written contract so clearly that the responsibility and obligations of both the architect and the client are mutually understood. This is not a plea for elaborate and lengthy legal documents, cleverly worded by lawyers for both parties to cover every possible contingency that may arise; on the other hand, it cannot be doubted that the skill with which the contract is drawn and the clearness with which each element is phrased are most vital to the elimination of unpleasant controversies.

Probably the most important group of misunderstandings arise over the approval of preliminary plans. Few clients realize that when the preliminary drawings have been revised and restudied until they meet his requirements, his approval commits him to additional charges and costs if changes are subsequently directed. This is a matter the architect can largely control in two ways. First, he can make certain that the final preliminary drawings incorporate every feature with which the client is concerned; in other words, that they are complete with the exception only of structural features. In this connection the architect can advantageously prepare such thumb-nail perspectives and sketches as may be required to enable the client to visualize the structure more conventionally presented in the drawings. The second step is to go through a complete check list of all items mentioned by the client in preliminary conferences, together with all items which must be incorporated in the final working drawings and specifications, making written notes as to the client's reaction to each point before proceeding further. This work should then be followed by a written statement to the client to the effect that the approval granted to the preliminary drawings and check list completes the first part of their contract, and that in accordance therewith subsequent changes directed by the client are subject to an extra charge. By accompanying this memorandum or letter with a bill for the preliminary drawings, the architect at once brings to a head two matters: first, he establishes the client's written approval of the work thus far performed; and secondly, he obtains compensation for his services, or else immediately brings up any evidence there may be that the client is dissatisfied with the work so far accomplished. Neglect to render a bill promptly when payments are due is unbusinesslike and may lead to difficulty later on.

The next important group of difficulties surrounds the opening of proposals for construction. This generally brings to a head the architect's control of building costs, and is of extreme importance whenever the client has indicated a definite limitation upon expenses and has required the architect either in writing or by direct implication to keep the cost within a predetermined maximum. In a previous article we have discussed methods of keeping costs within a fixed budget. If the architect has followed those methods throughout the preliminary stages of his work and has acquainted the client with the effect upon costs which his decisions in the preliminary work have made, most of the trouble usually encountered at this stage is eliminated. The remaining problem arises from the fact that no preliminary estimates are sufficiently accurate to assure in advance the size of the ultimate contract proposals, and frequently bids are received so far above anticipated figures that the client is imbued with doubt as to the effectiveness with which the architect has controlled costs. Frequently the first bids received are higher than need be, due to misinterpretation of specifications or drawings on the part of the bidders, which can be cleared up through a frank discussion of the estimates with the low bidders. When this recourse fails to bring the price within the client's requirements, the architect is forced at considerable expense to revise his drawings and specifications and secure new bids in order to satisfy the client that he has performed his part of the contract in the proper manner. These difficulties are largely eliminated by constantly acquainting the client with the cost aspects of his building project as they develop in the early stages, and by explaining the margin of error which necessarily exists in preliminary estimates and which can only be determined by these actual proposals. One of the most successful methods employed by several leading architectural offices is to obtain from several contractors, who are ultimately to be invited to present final proposals, preliminary estimates based upon the approved preliminary drawings. This enables the architect and the client to reach some approximate agreement as to changes that may be necessary before the preliminary drawings are carried into the working drawings. When this is done the architectural office must exercise exceeding care that the final drawings and specifications do not deviate in any respect from the preliminary drawings without written approval of the client and an understanding of the effect upon cost of the modifications.

The third group of difficulties arise during the contruction operation. Lack of adequate supervision,—or perhaps lack of appreciation on the part of the client of what constitutes the architect's supervisory responsibilities,—is a fertile cause of misunderstanding. Forty per cent of the total fee is usually charged for supervision. A considerable amount of work in this stage is done in the architect's office, checking shop drawings, selecting and approving materials, preparing full-sized details and checking contractors' requisitions for payment. This work is seldom visible to the client; he conceives of supervisory work as being confined largely if not wholly to the architect's presence on the site during all construction stages. Frequently the client is not at the building when the architect or his representative appears. He, therefore, measures the architect's attention to this problem by the number of times he finds him at the site. Two solutions are offered to this problem. The first is to explain to the client in the early stages or to incorporate a clear statement in the contract as to the actual services which are to be rendered; another effective system is to have the superintendent submit a brief written report to the client following each visit to the work, indicating the conditions found and the general progress being made with respect to the anticipated completion date. If this is not done, at least such a statement should accompany each bill rendered for services during that particular construction period.

The other problem of collecting fees is due to the credit of the client. Promotional projects are the usual source of difficulty in collecting the fees that have been established. It is no reflection on the architect if he insists in all cases upon some evidence of the client's capacity to pay for the work he has ordered, and particularly is this important when the client is not well known to the architect or of such prominence that his credit standing can be readily checked through the usual mercantile sources. Many times have architects failed to give a thought to this problem in their anxiety to obtain commissions for interesting or imposing construction projects. The architect has only himself to blame if he does not ascertain the credit standing of his clients before undertaking a commission. Subsequently, however, much difficulty can be avoided if bills are rendered promptly in accordance with contract agreement as each stage of the work is completed. When the bills are not promptly paid, the architect should follow up the matter without delay, and if necessary decline to proceed with work until the matter is adjusted.

To summarize, then, the problem of architectural fees and how to get them resolves itself into a matter of good business judgment and good business conduct. Charges should be established upon a sound basis which represents adequate compensation to the architect for his skill and time, and adequate value to the client as a result of the work performed. Getting architectural fees is first a matter of intelligent salesmanship, not of "horn tooting"; and secondly, of conducting each stage of the work that credit problems are eliminated at the start and that a complete agreement is maintained between the architect and his client on every problem that arises which involves the client's decision. A final matter is to keep the client well acquainted throughout the project with the work actually being done by the architect, so that no doubt may arise as to the adequacy of the service for which the client is paying.

THE AMERICAN PUBLIC BUILDING

THE POPULAR MISCONCEPTION OF ITS PURPOSE, AND ITS CONSEQUENT LACK OF USEFULNESS

BY

ARTHUR T. NORTH

IT is a frequently made and generally accepted statement that "the past half-century has witnessed greater architectural development than the entire previous history of the world." This is true, because, preceding the past half-century, many of the essential materials of modern construction did not even exist.

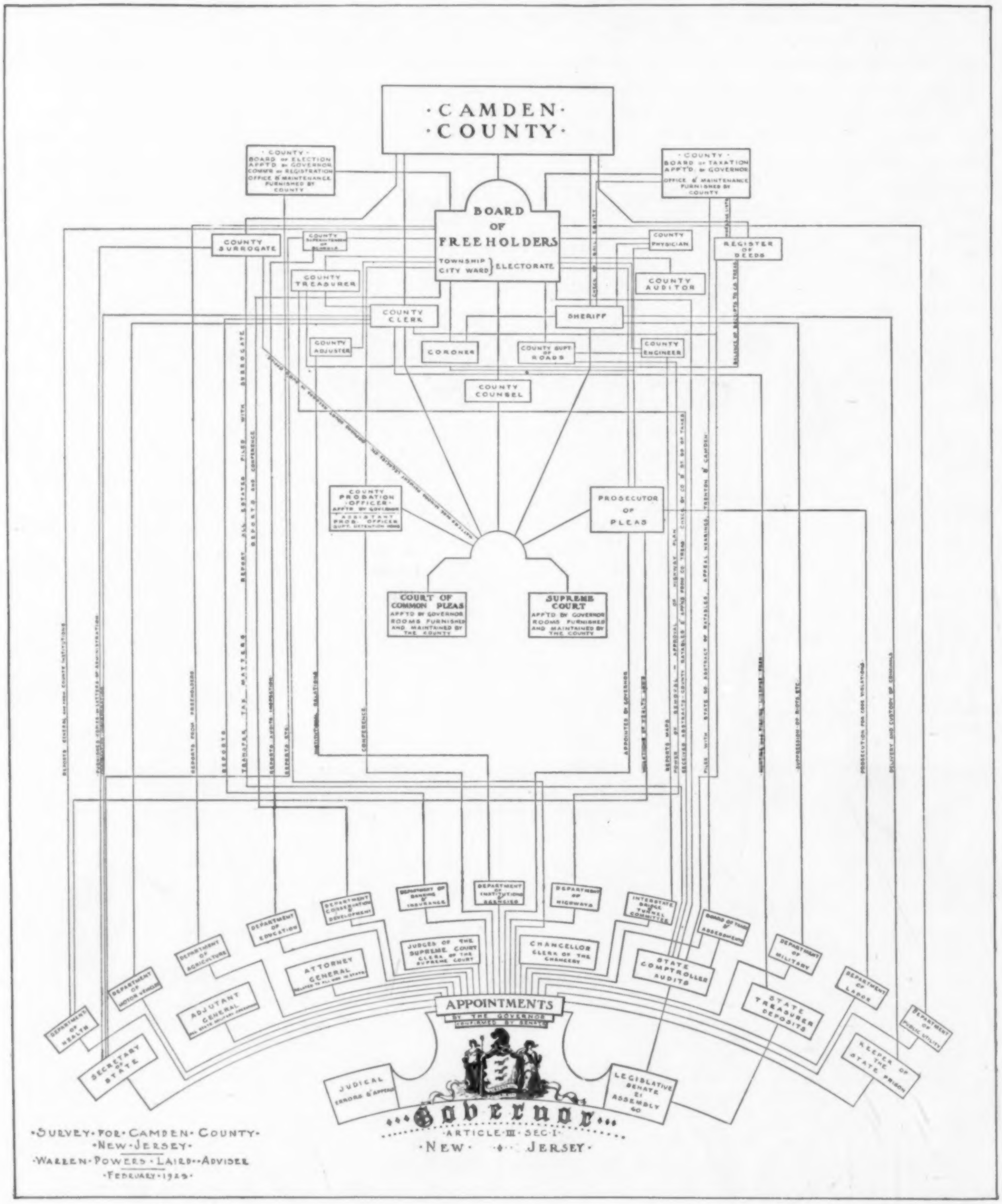
Commerce and industry jointly constitute the mainspring of this architectural development, actuated directly by necessity and accumulated wealth. The three principal elements of the new architecture are the plan for essential utility, the structure for strength and durability, and the enclosure for protection. There is an indissoluble economic tie between the useful building and commerce and industry. As the latter expanded, the useful building came into being, perhaps very largely through the contributory and creative efforts of the structural engineer, the heating and sanitary engineer, the electrical engineer, and the transportation engineer who has devised our elevators, escalators and conveyors of every kind. Along with this development of commercial and industrial building, equal development has taken place in the dwelling, the theater, the schoolhouse and other buildings. All of these types have responded almost immediately to the changes in our style of domestic life, amusements and of education.

One type of modern structure, however, can usually be classed as a failure,—the public building, more particularly the public structure used for governmental purposes. The American public building,—state house, court house or city hall,—is often a failure because it lacks the essential element of utility. Several reasons contribute to this failure,—some of ancient origin and some of this day. In old times the governmental building might have been the palace of the king and his fortress, the archiepiscopal palace in some countries, the feudal castle, or the cathedral. In each of these were housed authority and wealth,—the people were largely slaves, economic, political and religious. These buildings,—the palace, fortress, cathedral, or castle, were of such sizes that they always dominated the surrounding country and adjacent buildings, and the more wealthy and powerful the government the more imposing was its housing. The building, then, became the visible, unchanging symbol or manifestation of government.

This conception of government buildings was

Perspective Showing Relation of Old and New Court Houses, Camden County, N. J.

Edwards & Green, Architects; L. F. Pilcher, Consulting Architect



Graphic Analysis of State and County Functions, based on Constitution and Statutes

brought to America, and quite naturally, because political freedom was not in existence at that time. When America did become free it was, perhaps, an exhibition of egotism and, maybe, a manifestation of an inferiority complex that inspired the pretentious public building. After becoming free from foreign domination, we built our capitol at Washington with its great dome and imposing approaches. Was this merely because of tradition, or was it a defiance to the rest of the world? The form of the capitol at Washington was followed by those of most of the states, and we now possess a collection of domed state houses that are unequaled for ugliness and inefficiency. It is a subject for useless speculation, it is true, as to what our public buildings would be had the capitol been designed for

utility first and dignity second. It is apparent that, as we descend in the scale of governmental importance and wealth to the county and municipality, the public building becomes progressively worse. Reproduction always deteriorates from the model; it is inevitable, and, strange to say, no apparent effort was ever made, except in perhaps few instances, to employ an adequate style for public buildings.

Architectural competitions for public buildings are largely a political expedient. Elected officials aim to avoid any appearance of discrimination between architects which might reflect on their professional ability, and the competition is held to maintain a position of apparent fairness. Architects are the only professional men who have to compete for commissions. It is unheard of to require lawyers, physicians, surgeons, engineers and other professional men to compete by submitting samples of their wares. The custom of holding unregulated competitions was attended with evils that precluded the participation of many of the more competent architects.

Some leaders of the profession, recognizing the barriers to satisfactory results of competitions, entered into a campaign to improve conditions which resulted in the adoption by the American Institute of Architects of rules for conducting competitions. Competitions conducted according to Institute rules with *experienced professional advisers* are productive of very satisfactory results. In some competitions it is customary for the competitors to select by ballot the architect member of the jury of award, thus insuring competent architectural judgment. Generally effective precautions are taken to preserve the anonymity of the competitors. Competitions today, however, too often are disappointing, and these should receive condemnation.

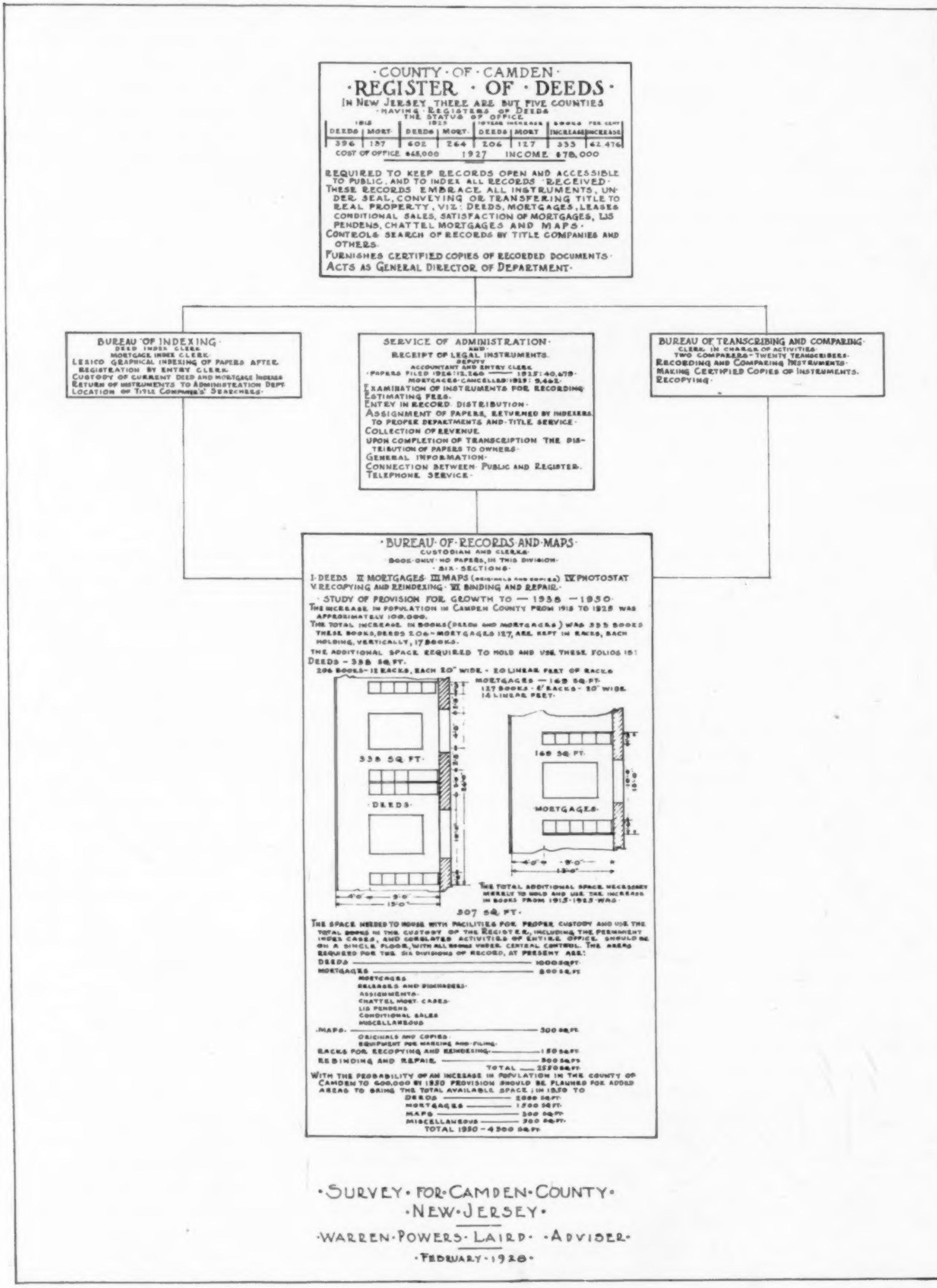
A public building is merely a place in which the public's business is transacted,—that is its essential purpose, and utility must be the objective of the plan. The question arises, how are we able to recognize or determine what constitutes utility in a public building? In the usual "Institute" competition an "architectural adviser" is chosen who prepares the basic program of the competition. This program usually allocates certain floor areas to the various departments or bureaus that are to be housed. How this allocation is determined is not generally known, but probably it is agreed upon between the architect and the heads of the departments or bureaus. The official or department head may or may not be competent to advise,—he may not even be familiar with the routine process of his office. Such is the result of our political scheme of "spoils to the winner" or election by a popular vote that has no knowledge of the functions of the department or the requisite ability of its head. The public building, as we have it, is not fundamentally right. It is true that the business of government has expanded greatly within the past two decades and that it will continue to expand with increasing population and new governmental functions. Today many states, counties and cities are building new state, county and city "office buildings" in which to conduct their business because their monumental buildings are found to be unsusceptible to alteration for greater usefulness. If we would measure the waste space in vast corridors, rotundas, excess story heights, unused attics and domes, it would be found that it would provide space for sizable and useful office buildings in which the public's business could be conducted economically and efficiently. Planning has now changed its emphasis from Beaux Arts *parti* to efficiency!

A fine example of recent and efficient building is that in Camden County, N. J. The existing court house became inadequate for the increased business of the county, and the board of freeholders employed Dr. Warren Powers Laird, of the University of Pennsylvania, to make a survey of the existing conditions and draw up recommendations for future procedure. Dr. Laird and his associate, Professor Pilcher first made an analysis on which were based the recommendations. The functions of county government are prescribed by statutory enactments which are the basis of the analysis. The analysis and recommendations were divided into four items:

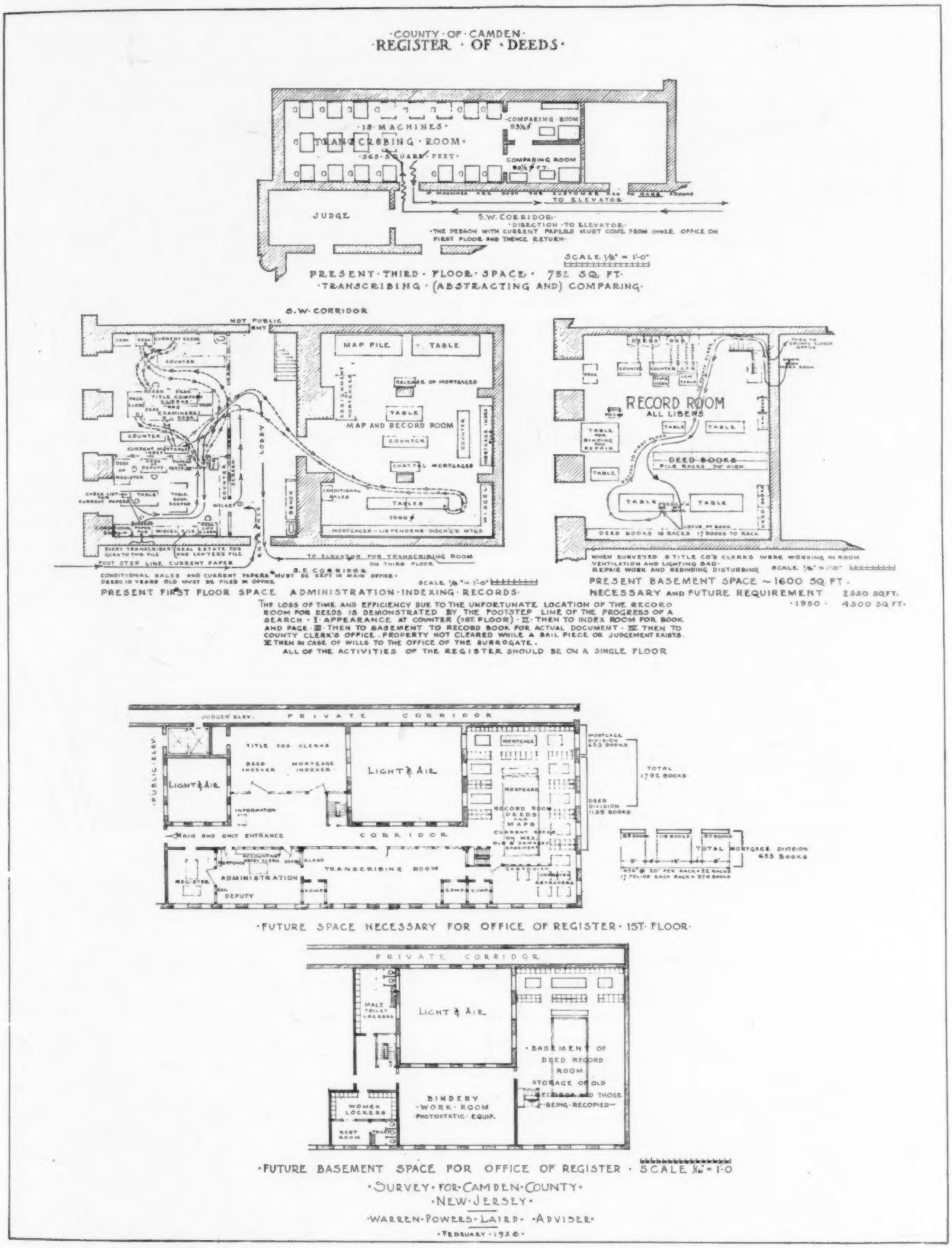
(1) The origins and inter-relations of state and county activities as provided in the statutes.
(2) The exposition of local or county activities to determine location and relation of parts.
(3) An analysis of the several county activities and their method of operation.
(4) A translation into plan diagrams of room arrangements with equipment suitable for present and future requirements.

Utilization of the present court house in connection with the new building was a factor in the problem, which involved certain changes in the existing structure. The proposed building operations are intended to accommodate the county business until 1950, and provisions are made for future extension when necessary.

A chart was prepared showing the relations between the various county and state departments or officials, both elective and appointed. A second chart shows the relations of the board of freeholders with the county officials appointed by them, the various committees of the board, the elective county officials, and the officials appointed by the governor. These two charts indicate the relationships and the functions of the county government. Specific charts were made for each department, bureau or official, on which are memoranda on its functions, personnel, nature of services, documents, files and equipment. From these data and their analysis were prepared plans showing the resultant space needs and the forms they should take, in both the new and old buildings, for the most efficient and economical operation. The survey in an important sense is a representation of cause and effect. The statutory and administrative causation of the many activities of county government determines a basis which con-



Detailed Analysis of the Functions of the Register of Deeds, showing Divisions of the Work, Various Kinds of Records, and the Area of Working Space Required for Each. This Type of Analysis was made for Each County Office.



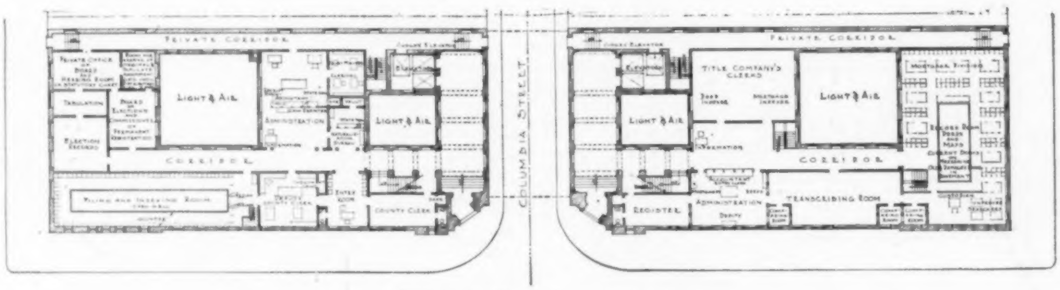
Analysis of Arrangement and Working Routes of Present Office of Register of Deeds, and Revised Arrangement Recommended for the New Court House.

stantly increases in its demands for efficient housing, resulting from the continued growth in population, commerce, wealth and social requirements of the community.

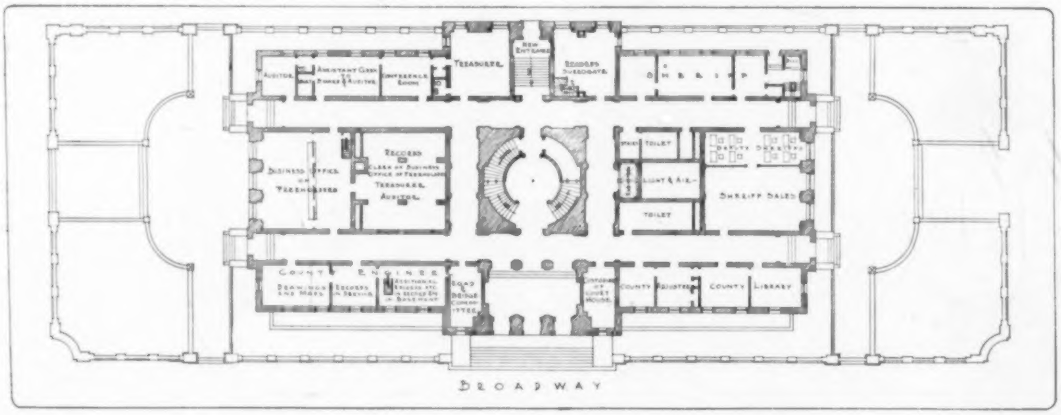
The solution of the problem of what constitutes a suitable public building can be attained only by such a method as is here described and, in part, illustrated. It is a rational and scientific method, logically developed from certain fundamental data. Should this method be adopted generally by public officials who are authorized to erect public buildings, such structures would emerge from the classification of our most wasteful, inadequate and architecturally inferior buildings into a classification comparable with the best of our industrial and commercial structures. Dr. Laird's report contained an estimate of the cost of remodeling the existing court house, dome repairs, the new court house, paving and other items. Charts showing the functions of the various officers, departments and bureaus, floor plans for their proper housing, plans for the new building and alteration of the old, block and traffic plans,—to the number of 36,—supplemented the written report. It is a splendid exposition of how to ascertain the record facts, to express the facts in charts and plans, and to estimate requirements in terms of future population.

A study was made of the routine of public business in each department, and the suggested plans were made so as to facilitate its dispatch. In the old building it was found, in some departments, that the routing of business was very unscientifically arranged, causing delay and inconvenience. The planning of any place wherein business is to be transacted is as definite and scientific as laying out a railroad freight yard. Our public buildings are usually mere aggregations of large and small rooms to which the work of the occupants and the public must be adjusted, and the result is that they are often wasteful, inconvenient and inadequate. The work must first be laid out, and to it the room be adapted. A freight terminal laid out with equal lack of intelligence would not function. Architects must realize that planning, in many instances, is a scientific and definite process similar to that of any other engineering project.

Dr. Laird has produced a splendid example of what constitutes logical and scientific planning, the process of its making, and its coördination into the form of a complete building. When this is done, the enclosure of the structure is but a further application of analysis and conclusion. Utility was here the basic consideration, and artistic enclosure the corol-

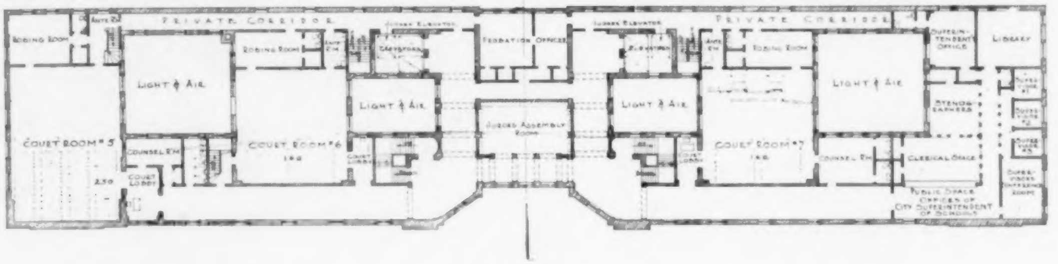


Proposed New Court House
Sixth Street

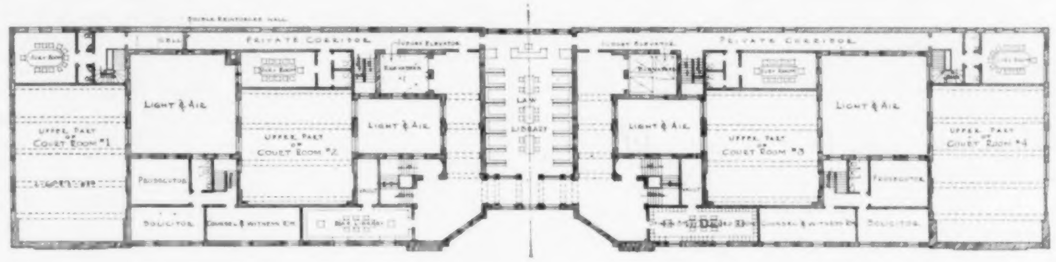


Old Court House

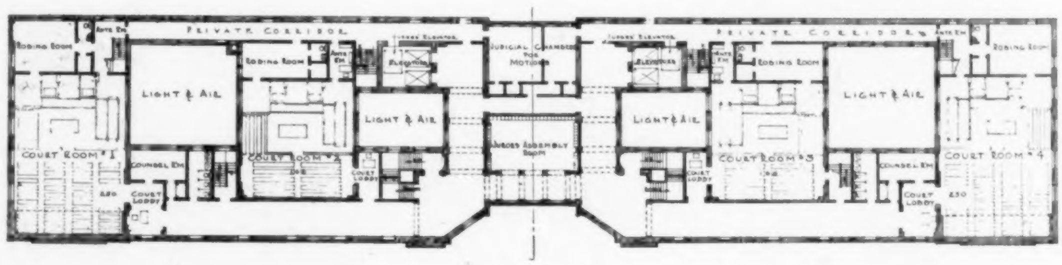
First Floor Preliminary Plan Showing Relation of Old to New Court House. Later Development Closes Columbia Street, Making a Lobby of this Area.



Third Floor



Second Mezzanine



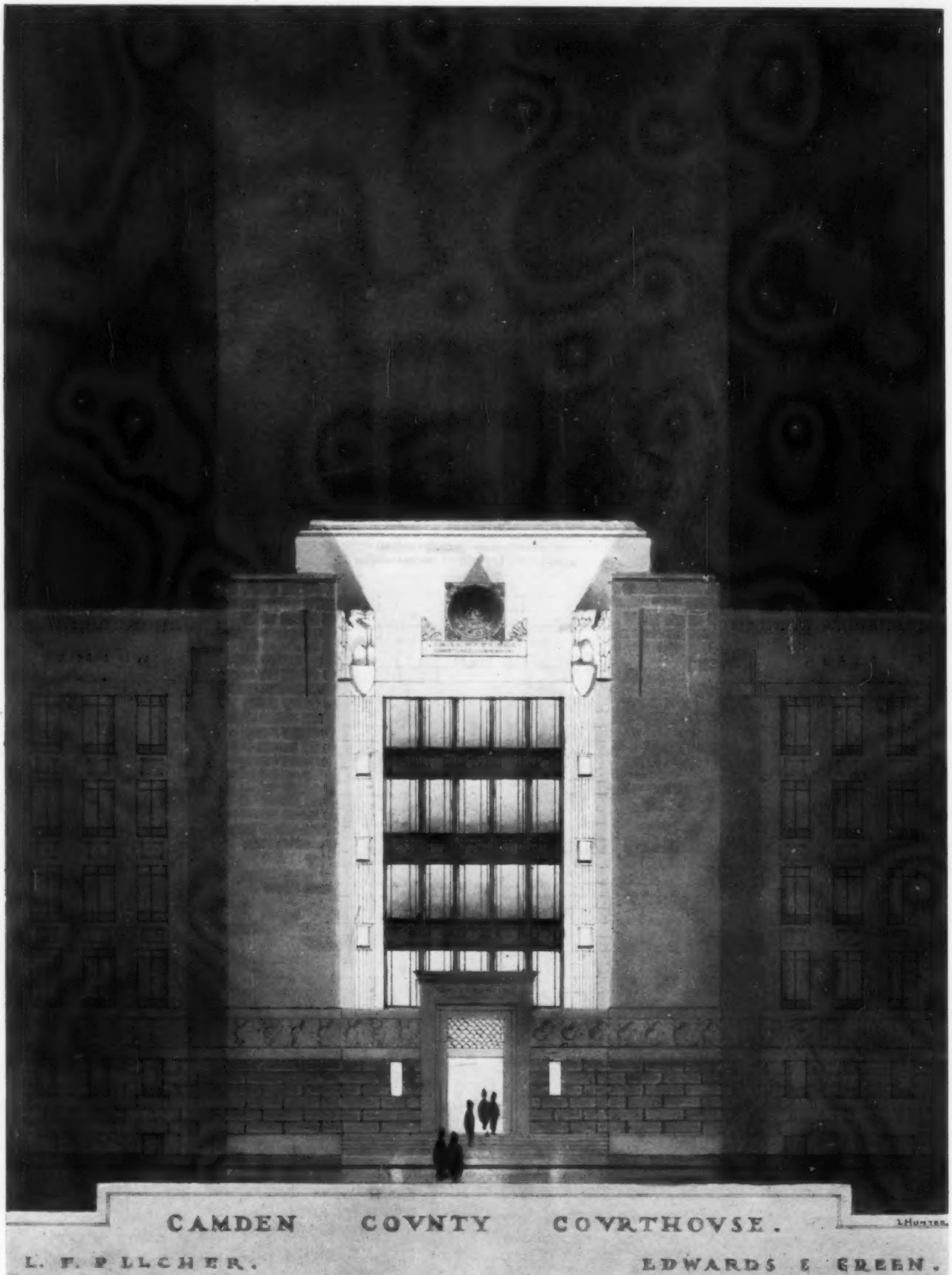
Second Floor

Preliminary Plans of Upper Floors of New Camden County Court House Showing Lofty Court Rooms and the Use of Mezzanines for Various Services. Fourth Floor Plan Is Similar to That of Second Mezzanine

lary,—the result being most happy and satisfactory. Making such surveys, analyses and recommendations is justly within the scope of architectural professional practice. In fact, no other persons are better qualified to perform such services. And, when allied with that other function of architecture, city planning,—and so employed jointly,—all the problems of governmental housing, urban traffic and community improvements will be solved in the best manner.

The Court House Annex Committee, of which Dr. Leslie H. Ewing is Director, as well as Director of the Board of Freeholders, made an intensive examination and study of Dr. Laird's survey and recommendations. The Committee referred it to the Board of Freeholders with a resolution recommending its adoption. The architectural adviser appeared before the Board and described all of the subjects treated, and the Board by resolution unanimously adopted the report. The improvements were authorized, Edwards & Green of Camden were employed to prepare the plans and supervise the construction, and the Board also employed Professor Lewis F. Pilcher, Vice-dean of the School of Fine Arts, University of Pennsylvania and former State Architect of New York, as consulting and advisory architect.

Editor's Note. Since the action here described of the Board of Freeholders, the City of Camden employed Dr. Laird to make a survey and recommendations for a new city hall and its location, together with a municipal bus terminal, and has retained Professor Pilcher as consulting and advisory architect. It has been decided that the new city hall will be built jointly with the new Court House Annex for reasons of economy and convenience. These will be published in due time in THE ARCHITECTURAL FORUM.



ARCHITECTS' RENDERING OF ENTRANCE PORTION OF NEW CAMDEN COUNTY COURT HOUSE

/

THE ARCHITECT AS CONSTRUCTOR

PART II—WHITHER DO WE TREND?

BY

WILFRED W. BEACH, ARCHITECT

IN a preceding article in these columns (May, 1928) the author attempted to set forth several reasons for assuming that architects should, in certain instances, for the good of the profession and in the interests of their clients, essay the actual execution of their brain products rather than assign it to low bidders and take chances on what ensues.

No claim of originality can be made for this idea. Several years ago, D. Everett Waid, discussing in *The Brickbuilder* the work of Mann & MacNeille, New York architects, took occasion to say, by way of comment: "The tendency among architects to sublet work and even to execute it by employing labor and contracting for materials themselves is perhaps due to the existence of many incompetent brokers who call themselves general contractors. That tendency may receive an impetus when architects realize that their proper standing is jeopardized by the growing power of a class of contractors who are dealing altogether with owners and with an avowed purpose of standing between owner and architect, and even employing architects as a subservient part of their own organizations. Desire for self-preservation should warn present-day architects that they must thoroughly qualify themselves with practical knowledge of materials and construction and structural design. Otherwise, they may find themselves on a salary basis, making artistic sketches for business men whose main interest is money profit, and who have not the æsthetic appreciation which animated the craftsmen-architects of old."

Mr. Waid prefaced this by saying: "Many architects are called upon to do such (construction) work occasionally and to a small extent; but perhaps only one architect known to the writer (other than the firm mentioned) possesses a construction department that has developed a complete organization trained to estimate costs, to buy material and hire labor, and to execute construction work according to its own standards."

But there appears to have been a more or less steady increase in such practice since the time at which Mr. Waid wrote, as witness the operations of Addison Mizner in Florida and those of Benjamin Marshall in Chicago and elsewhere. That there is a wholesome satisfaction in following this line of endeavor, which agreeably supplements that of creating the ideas in the drafting room, is not to be doubted. One has but to enjoy the experience to fully appreciate this!

Assuming that the practice of our profession is at once our calling and our means of livelihood, we are thereby undertaking certain responsibilities, not only for ourselves and our dependents, but for our clients as well. No matter which we hold to be of major importance, our obligations to our clients are considerable. The question is, are we carrying out those obligations to the best of our respective abilities by seeking to remain only the artistic designers mentioned by Mr. Waid? We are, if architecture is a thing of lines and renderings only. But we cannot help but realize that it is much more than that. If so, are we shirking our responsibilities by choosing only the easier and more enjoyable tasks and delegating what we deem the arduous and more risky details to those supposedly without our ideals, —to be evolved with or without our supervision? Is it enough for one to say "I've adopted architecture as a *profession* and see no reason for turning commercial by branching out into construction"?

But commerce is not necessarily criminal. It merely has criminally inclined barnacles clinging to its unexposed surfaces. One can be quite commercial without soiling one's delicate fingers. In fact, most of us would be considerably broadened, possibly improved, if we were privileged to have more business experience. This article is not, however, intended as an argument in favor of all architects' jumping at once into the building field in an effort to do away with the general contractor. It is to be considered more in the light of an academic discussion of the present-day trend of the general practice of design and construction; not, strictly speaking, an arraignment of either. It was inspired by the published statement, in considerable detail, of the secretary-manager of a Texas association of general contractors who may be assumed to reflect to a considerable extent the opinions of many others throughout the whole country. There he vigorously decried the effect of competitive-bidding contracting because it not only induces the owner to "indulge in the common pastime of 'whip-sawing' the three low contractors" but influences them to give "their 'subs' and 'dealers' the same or worse treatment than they complain of on the part of owner and architect."

Quite disregarding any theory as to what causes a contractor to mistreat his "subs and dealers," we believe that there are still many general contractors upon whom architects are justified in depending for the execution of high class work, but we agree with Mr. Watson, the secretary-manager just quoted, that competitive bidding does not tend to produce such.

Aside from any argument on the subject, however, there is really no sound theory for asserting that the architect has less right in the construction field than has the contractor or engineer in the preparation of building drawings and specifications. Perhaps each should stay in his own corner, though it

would appear that a distinct process of evolution is at work to bring him out. If so, why should the architect be the one to refuse to "evolute"? Tradition, conservatism, pride and inertia tend to hold him strictly to his professional sphere, though he may be missing considerable of the joy of creating by that very conservatism. No need to write volumes on the subject of an architect's experiences with low bid contractors. Probably no architect will aver that he enjoys watching over them or hiring others to do such detective work,—nor later explaining to the owner why certain things slipped by because the detective was neither omniscient nor omnipresent. We may agree with Mr. Watson that "even the ordinary honest contractor, faced with a possible loss through a price competition, forced bid, can find many ways to skimp his work,—giving construction that will pass the eye of the average inspector, but not giving the owner the quality he wants or thinks he is getting." But are we to agree further with him in his conclusion that "in the main, future construction work will be handled by firms which unite in one organization the functions now separately performed by architects or engineers and contractors?" It would appear that the contractors have thrown down the gauntlet,—that some of them, at least, are of the opinion that either the architect or the general contractor is to dominate the building of the future to the practical elimination of the other. We are not, at this writing, attempting to either prove or disprove this,—not even discussing the plausibility of the theory. We do know that certain general contractors have been striving for some time to eliminate the architect (and succeeding in doing so, insofar as their work is concerned), and that certain architects have successfully conducted their own construction operations. Whether or not these are phases indicative of a distinct trend in the evolution of the building industry, who can say?

Basing our dissertation upon these premises, we merely seek to show that it should be no more difficult for the architect to maintain his status as "the boss of the works" under such a new dispensation (or is it a swinging back of the pendulum to an older order?) than for the contractor to usurp that function. Nor, we maintain, will the architect sacrifice any of his dignity by becoming a practical builder. If there be caste in the personnel of the industry, present-day architects must assume their stratum to be located somewhere between the high level of the creative designer and that of the aforesaid detective. May not that of the honest builder be assumed to be at least as high? Obviously, being good builders is better than being poor detectives, which the gentleman from Texas considers us. Perhaps, as usual, "the proof of the pudding is in the eating." It is of less import to convince members of our profession that they should add construction forces to their organizations than to offer assistance to those who contemplate such an undertaking. Such a departure is not, to be sure, to be lightly undertaken. It is a serious matter and, once decided upon, introduces more novelties into one's practice than merely the buying of materials and the hiring of mechanics.

As we are often made painfully aware, one of the most important of an architect's functions, perhaps the most vital to his practice, is that of getting the business to keep his office going. So long as he adheres to a strictly professional status, his competition is, to a large extent, confined to that with others in the same line. He seldom has opportunity to compete with contractors who offer "planning service," even if he dared to do so. Such business is generally "cinched" by trained salesmen before the architect has heard it is in prospect. And it is into the field occupied by these contestants that the constructing architect is entering in order that, for the good of the owner as well as for the profit of the architect, the independent existence of the latter shall not be too greatly circumscribed. The percentage of his former clients and of those new clients naturally coming to him, who may be convinced that his scheme of "cost-plus" building is quite sane, may be too small to warrant the change in policy,—probably it would be. In any event, the architect may be presumed to be seeking to enlarge his clientele by means of his new form of practice.

He must go out after new business. In order to best fit himself to secure it, he must first convince himself that he has better buying ability and better construction methods than (or, at least, equally as good as) those possessed by others. This may not be difficult. He has learned by painful experience what are the outstanding shortcomings of the average general contractor. Summed up, chief among these are:—

1. Indifferent buying.
2. Straining credit to the detriment of close buying.
3. Buying from favorites or to repay obligations.
4. Too little price competition, for various reasons.
5. Poor foremanship.
6. Too much dependence upon foremen.
7. Too meager instructions to foremen.
8. Insufficient expediting.
9. Unbalanced expediting.
10. Careless general supervision.
11. Poor bookkeeping.
12. Slack (or nil) cost accounting.
13. Intense application to business getting at the expense of other activities.
14. Substituting shrewdness for efficiency.

The list might be indefinitely extended. It may be considered the natural result of the competitive bidding system and the temptation it offers to the crook or the shyster. This is not an indictment of all general contractors, by any means, but of the many who have not the inherent honesty or strength of character to fortify them against temptation. The experienced architect is well aware of the more gross deficiencies of these gentry and can, when he seeks to displace them, so equip his forces and so conduct his operations as to eliminate such defects and others.

In the matter of buying, he has a considerable advantage over the ordinary general contractor,—as has any builder who installs his own drafting room. He is not limited as to the number of copies of drawings he can send out for factory bids, nor has some one else the fixing of a dead line when those bids must be in. He can assiduously seek the lowest prices, consistent with satisfactory output. Contractors too often buy through accustomed channels, even when other supply concerns are much more in need of business and are willing to bid accordingly. General contractors are also likely to favor those whose bids have been used in securing the work, regardless of whether or not their prices are bedrock. This is ethically proper, to be sure, but it is not of particular benefit to the owner. For instance, a local contractor on a certain remodeling project would have used a bid of $1,500 for the millwork, the lowest local price. But the owner entrusted his work to a constructing architect, who located a good mill 800 miles away which actually needed the business and delivered the goods, "f.o.b.", for $750. Nor is such an event unusual. We have all remarked upon the unaccountable variation in bids that is always to be expected on minor items. Another case in point is that of three bronze-plated grilles needed to fill certain openings in an office counter. The concern supplying the counter priced them at $50 each. Bids from ornamental metal concerns ranged from $45 to $250 for the three,—and they were ordered and delivered at the lowest price. For a country bank building, the two local hardware dealers (one of whom any local builder would surely have patronized) each asked $200 for the finish hardware. The constructing architect bought the same bill from a wholesale house for $135. The wholesaler wanted $87.50 additional for kick-plates, thresholds and push-bars, not on the original list. These were obtained from a manufacturer for $67.50. Verily, there is much of interest in the life of a purchasing agent!

Another advantage possessed by the architect is that he has not someone else's restrictions to prevent his getting prices on materials of different values. The highest priced, which might be the only material which would satisfy a specification calling for strictly "first class," may not be absolutely necessary to the location,—but a contractor's attempt to substitute, even at a price allowance, might be viewed with suspicion. He is supposed to profit by all changes, hence had best be held to the terms of the contract. Departures therefrom are not to be encouraged. But the constructing architect, doing business under a "cost-plus-lump-sum" contract, has no such inhibitions,—he can make all such changes to the sole benefit of the owner. He need not invariably buy "first class," when the particular need does not require it. And he has the further advantage of being able to pay cash,—with the owner's money,—and to take all benefits of cash discounts. It will also be found that prices quoted on a strictly cash anticipation are frequently lower, even when not subject to discount. In the matter of selecting foremen, one must exercise the greatest caution and acumen. A foreman can make a project successful, with proper support, or he can mar it in short order. Good foremen are not easily secured. Good general foremen are exceedingly scarce. The policy of trade unions in denying their members permission to learn or work in more than one trade doesn't make for the training of general foremen. They must arrive outside of, or in spite of, union restrictions. But general foremen are to be found, nevertheless, and should be well paid,—they must be properly remunerated in order to be held, and they must be handled with tact. They know that they know, but may not be so sure that the architect does. They have had experience under all sorts, and their respect for the new employer needs to be carefully developed.

It is not to be supposed that any architect will, without previous experience in building construction, suddenly embark upon such an enterprise on a large scale. But most of us have, at one time or another, carried out minor operations through direct employment of labor, and have executed larger work by means of multiple small contracts to the exclusion of a general contractor. If this further comprehensive step is to be taken, however, it must be only after due consideration and proper preparation.

One must decide what crafts will be subcontracted and what will be directly employed; whether the project will be "union" or "open shop," and what equipment is necessary. The latter had best be procured only as needed for each project. Perishable items, such as buckets, hose, rope and material used and destroyed in temporary construction are to be charged to the particular work; others, such as barrows and general building equipment, are to be charged to the builder's overhead and remain his property. The larger items, such as concrete mixers, hoists and the like, can be either purchased or rented as is deemed advisable. In either event, the owner should pay rental for such items of major equipment as are used on his work.

Now, to return to the important subject of getting the business. If the architect has already established his prestige as a conservative estimator and the type of man who is dependable,—who will carry out his obligations, if it is humanly possible so to do,—he has built an excellent foundation upon which to erect his new business. His statements will be convincing and will carry weight accordingly. He can, among other things, show how work by his own forces will reflect these advantages to the owner:—

1. It can be started without waiting for drawings to be completed and without loss of time in taking general contract bids, thus materially reducing carrying charges.

2. The architect, and the owner through the architect, will exercise more direct control over the laborers and minor contractors.

3. The builder, by using the owner's funds instead

of his own, does not have to add interest to his carrying charges, but can buy in the lowest markets and take advantage of all possible discounts.

4. The cost of a builder's bond is also saved.

5. The owner finds himself paying lowest costs for the most suitable materials and appliances, instead of paying the highest prices a contractor is able to collect for what must be inspected and judged.

6. Changes can be made at net cost. The "extra" bugaboo is avoided.

7. By the judicious use of premiums and bonuses, especially good and speedy performances may be secured, without being found unduly expensive.

8. Occupancy of the premises or any part thereof can be had by the owner before completion, without question or added expense.

9. In case the work is prematurely terminated, adjustments can be affected with minimum trouble. This is sometimes valuable in cases where churches or lodges have not been able to collect subscriptions. They can quit if and when their money runs out.

10. The one point in favor of competitive bidding contracting is that the owner is thereby supposed to know in advance what his building is to cost. Barring extras, he does acquire this information. But he is a long way from knowing if it is costing as little as it should or if he is sure to get what he is paying for. With the architect as builder, the owner does get what he is paying for and at actual net cost. More than that, he should not expect. It is admitted that general contracting is a gamble,—with the owner a novice playing the other fellow's game. For that reason, he hires the architect (if he thinks he needs him) to look out for his interests. But frequently the contractor is smooth enough to have the architect set aside, thus removing one of the gambler's obstacles.

Having "sold" the commission, if he be so fortunate, the architect proceeds with the drawing up of a contract, the approval of preliminary sketches, the preparation of working drawings, the selection of a general foreman, and the procuring of prices on the items first demanding purchase. The contract form included here was most carefully evolved from several under consideration and has been repeatedly used. The fundamental idea is that it is merely an expression of mutual understanding between two parties who have absolute confidence in each other and merely desire a record of their understanding. Such a contract should never be entered into on any other basis. It will not safeguard an owner against swindling by a dishonest builder any more than will any other form of cost-plus contract. There is no way of enforcing honesty in a purchasing agent if he chooses to be a crook. One can only check him up and get rid of him. In this sort of a contract, the architect (or builder) is merely acting as a purchasing agent, skilled in the buying of labor and material to produce a building.

The amount of his remuneration for such service is presumably discussed and arranged at the time of his employment. If he be the type of architect we are discussing and addressing, he has not been accustomed to cutting his prices to get business and will not now begin to do so. Naturally, the proper fee for the service we are describing is a combination of the customary architects' charge and the ordinary good contractors' profit. Experience will prove that new work costing upwards of $50,000 can be handled to advantage at such combined rate, but that alterations and minor operations at such a fee will not be particularly remunerative. Perhaps work costing over $500,000 could be done for slightly less, but it is hardly a safe assumption. We are discussing work done for profit and not for the average architect's "living wage." It is assumed that both the owner and the architect-builder are to profit by the deal. Close scrutiny of this contract form is recommended to any architect who proposes to conduct building operations. It can, no doubt, be improved upon, but it should prove a good basis upon which to found an agreement. Specifications used with it need no general conditions and but few supplementary general conditions. But one's instructions to the men on the site must be most ample and explicit. These will be set forth later in another article to be published in THE ARCHITECTURAL FORUM.

The subject of the various numbered articles of the accompanying contract may be summarized as:—

1. Description of the work.
2. Drawings and specifications.
3. Minor changes in the work.
4. Major changes in the work.
5. Expediting the work
6. Purchase of materials.
7. Invoices required.
8. Advancement of funds.
9. Itemized statements.
10. Payment of builder by owner.
11. Definitions of terms Equipment, Tools and Supplies.
12. Rights of owner's representative.
13. Lien indemnity.
14. Advertising signs.
15. Insurance.
16. Payment for builder's services.
17. Stopping of the work.
18. Arbitration.

These subjects might of course be incorporated as the headings for each article of the contract. A contract form as used by the author is given in full on the page opposite and on the page following.

THIS AGREEMENT, MADE this day of

Nineteen Hundred
BY AND BETWEEN of hereinafter

called the "Builder," and
hereinafter called the "Owner."

WITNESSETH that the Builder in consideration of the agreements made by the Owner, agrees with the said Owner as follows:

Article 1. The Builder shall and will secure all material and provide all labor necessary to the design, erection and equipment of

the Owner on its property located in as shown by the preliminary drawings and specifications prepared by the Builder and approved by the Owner, which drawings and specifications are identified by the signatures of the Parties hereto and made a part of this contract.

Article 2. The Builder shall furnish such further working drawings, specifications, details and explanations as may be necessary to fully describe the work to be done. All drawings, blueprints, and specifications are and remain the property of the Builder, the Owner, at option, retaining a set of each as a permanent loan.

Article 3. The Owner shall be at liberty to order minor changes from the approved drawings and specifications and the Builder shall revise his work to conform to the same (provided that due notice is given of the change and that said change does not involve delay in the completion of the work) without in any way affecting the terms of the contract.

Article 4. The Owner shall also be at liberty to order major changes from the approved drawings and specifications under the same conditions as set forth in Article 3, except that for each major change the Builder shall be allowed a fee of fifteen per cent (15%) of the estimated cost, such changes only to be made when authorized in writing by the Owner.

Note: Any change involving an additional expenditure of five hundred dollars ($500.00) or more shall be considered a major change.

Article 5. The Builder shall start the work at the site as soon as sufficient material can be delivered to insure continuous rapid progress of the whole work and shall do everything possible, consistent with good workmanship and minimum cost to push all parts of the work to completion. With the consent of the Owner, such premiums as are agreed upon between the Parties hereto may be paid to get quicker deliveries or secure overtime work at the Building, the extra cost of such procedure and of all personal expediting or tracing of shipments to be paid for by the Owner.

Article 6. The Builder will purchase all material and labor for the work at the lowest possible prices consistent with the grade needed, whether buying in the open market or by competitive bidding as may be found most expedient, and will supply such additional copies of prints and specifications as are needed to obtain lowest prices. The Builder will also take advantage, on behalf of the Owner, of any tenders which the Owner may receive for material suitable for the building and will also make use of such additional second-hand material as the Owner may provide for the work. All orders and contracts for material, etc., involving an expense of

or more shall receive the approval of the Owner before being placed.

Article 7. Invoices of all materials shall be secured by the Builder in triplicate. Original invoices shall be checked and approved by the Builder and shall accompany the monthly statements mentioned in Article 9. Duplicates will be kept on file at the Builder's Home Office.

Article 8. The Owner shall advance to the Builder, as needed, sufficient funds to meet all payrolls when due and to pay bills for materials in time to take advantage of possible discounts. In case it may be necessary to make advances before the actual payrolls can be made out or invoices furnished, then such advances shall be based upon estimates supplied by the Builder as to the amount of funds so required.

Article 9. The Builder shall furnish the Owner, on or about the fifth day of each month during the progress of the work, an itemized statement for the preceding calendar month, as defined in Article 10, of all labor, material, etc., incident to the work under this contract, and of all funds advanced by the Owner during such period. These statements shall be accompanied by the original invoices previously mentioned.

Article 10. The Owner shall pay to the Builder within three days after receipt of monthly statement above mentioned, the balance due the Builder up to the amount of the entire actual cost incurred during the preceding month; such actual cost to include the net cost of all materials, supplies and labor (including superintendent and foremen) provided; freight, express, and cartage charges; prevailing rental for equipment, etc., required for economical construction and for the time actually needed upon the premises; cost of fuel, power, light and water used during construction; net cost of sub-contracted work, materials and supplies; traveling and hotel expenses, incident to the work (and of special help when authorized by the Owner); cost of permits, fees and royalties; all premiums for insurance

carried on the work; all incidental expenses, liability and outlay incurred in connection with the work, such as telephone and telegraph charges, personal tracers, temporary sheds, fences, offices, toilet rooms, walks, soil tests and other necessary tests. Actual costs as above outlined give the Owner the benefit of all cash and confidential discounts of every nature.

Article 11. The following differentiation shall be made between the terms Equipment, Tools, and Supplies in order to reckon the net cost as described in the preceding Article:

"Equipment," on which the Owner shall pay rent, will include concrete and mortar mixers, excavators, wheel and slip scrapers, steam engines, elevators, hoists, derricks, drill machines, electric motors, gasolene engines, forges, pneumatic hammers, pumps, power saws, platform scales, wagons, surveying instruments, temporary heating apparatus, typewriters and desks.

"Tools," furnished by the Builder at his own expense, will include all small portable hand tools and mechanics' trade tools except such perishable items as will be charged under "Supplies."

"Supplies," charged to the Owner as part of the cost of the work, will include all special or perishable items necessarily purchased for the particular work. These remain the property of the Owner and may be disposed of by him at the completion of the work.

Article 12. The Owner's representative will be permitted access at all times to records, correspondence, account books, drawings, specifications, vouchers, invoices and payrolls relating to the work for the purpose of auditing the expenses incident to the work and gaining other information relating thereto.

Article 13. The Builder shall idemnify the Owner and save him harmless from all mechanics' liens upon the premises on which the building is located arising out of the work to be performed under this contract, provided that the Owner shall have paid to the Builder the amounts due at all times.

Article 14. The Builder may display at least two advertising signs in conspicuous places about the premises, such signs to be furnished, erected and removed all at his own expense. Other billboard privileges at the site remain vested in the Owner.

Article 15. The Builder shall provide such liability and compensation insurance as may be necessary to protect both Parties to this agreement (and as part of the cost of the building) except that the Owner shall provide fire insurance in amount sufficient to protect the interests of both parties to this contract, including building equipment and tools. At the option of the Owner, the Builder will also carry accident and public liability insurance, otherwise it is assumed that the Owner elects to assume such risks.

Article 16. In addition to the actual cost of the work as herein before defined, the Owner shall pay to the Builder for his services and for the use of his organization and tools in the construction of this work, the sum of

in installments as follows:

(Note: It is understood that the foregoing partial payments represent approximately 85% of the fee earned by the Builder up to the time such payments are stated to be due.)

Article 17. If the work should be stopped for a period of one month under an order from the Owner or any Court, through no fault of the Builder or anyone employed by him, or if the Owner should fail to pay to the Builder, within ten days of its presentation and maturity, any sum due to the Builder, then the Builder may, upon three days' written notice to the Owner, stop work and terminate this contract and recover from the Owner the balance unpaid for services under Article 16 and also full payment for all material furnished and all sub-contract and other work executed as well as loss and damages sustained upon any plant and material and upon any incompleted sub-contract, together with all cost of collecting such unpaid balance.

Article 18. In the event of any disagreement arising under this contract between the Parties hereto, it shall, upon written notice of either Party, be submitted to three arbitrators for decision. Each Party shall choose one arbitrator within five days after receipt of such notice, the third to be chosen within five days by the two thus selected. The decision of all or a majority of said arbitrators (which shall be rendered within..........days of the appointment of the third arbitrator) shall be final and binding on both Parties to this contract. The expense of such arbitration shall be agreed upon in advance and shall be borne equally by both Parties.

IN WITNESS WHEREOF the said Parties to these presents have hereunto set their hands and seals the day and year first above written.

...., Builder,

By ....

....

.... Owner,

By ....